

SAP

SAP Data Hub 2 on SUSE CaaS Platform 3

Installation Guide

SUSE CaaS Platform 3 SUSE Linux Enterprise Server for SAP Applications 12 SP5 and 15 SP1 SAP Data Hub 2

> Dr. Ulrich Schairer, SAP Solutions Architect (SUSE) Christophe Le Dorze, ISV Solution Architect (SUSE)



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Installation Guide

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SAP Data Hub 2 is a toolset to govern big amounts of data. SUSE CaaS Platform 3 is the Kubernetes base that makes deploying SAP Data Hub 2 easy. This document describes the installation and configuration of SUSE CaaS Platform 3 and SAP Data Hub 2.

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Today, more and more data is created in business and industry. Alongside data growth, there is an increasing necessity to manage and exploit this data. SAP Data Hub 2 is a tool that makes dealing with large amounts of data easier. SUSE Container as a Service Platform 3 (SUSE CaaS Platform 3) is the perfect foundation for SAP Data Hub 2.

1 Requirements

To install SAP Data Hub 2 on SUSE CaaS Platform 3, make sure to satisfy the following hardware and software requirements.

1.1 Hardware

1.1.1 SUSE CaaS Platform 3 Cluster

Hardware requirements (see SAP Data Hub Install Guide (https://help.sap.com/viewer/prod-uct/SAP_DATA_HUB/) ?) See SAP's sizing recommendations:

- SAP Data Hub 2.3 (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.3.latest/en-US/79724de552db4b2b81c4a893f2c7ed18.html)
- SAP Data Hub 2.4 (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.4.latest/en-US/7e2a9bf62ec94e9694648e2b5d2ce882.html) **a**
- SAP Data Hub 2.5 (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.5.latest/en-US) **a**
- SAP Data Hub 2.6 (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.6.latest/en-US) **7**

The minimum hardware requirements for installing SAP Data Hub 2 on premise are:

• 4 Kubernetes cluster nodes (1 master node and 3 worker nodes)

- The master node should be a 4 core machine with > 32 GiB RAM
- The three Kubernetes worker nodes should be a machine with 4 cores and with > 64 GiB RAM
- Access to a SUSE Enterprise Storage 5 system (see SAP Note Pre-requisites for installing SAP Data Hub (https://launchpad.support.sap.com/#/notes/2686169)

1.1.2 Management Host ("Jump Host")

It is recommended to do the installation of SAP Data Hub Foundation from an external jump host and not from within the SUSE CaaS Platform Cluster.

The hardware and operating system specifications for the jump host can be for example as follows:

- SUSE Linux Enterprise Server 12 SP5 or SUSE Linux Enterprise Server 15 (or even openSUSE Leap 15.X)
- 2 Cores
- 8 GiB RAM
- Disk space: 50 GiB for /, including the space for the SAP Data Hub 2 software and at least 20 GiB for /var/lib/docker (necessary for the SAP Data Hub 2 installation)
- Network connectivity to the SUSE CaaS Platform cluster (1 GBit/s)

1.2 Software Requirements

The following software is needed

- SUSE CaaS Platform 3
- SAP Data Hub 2
- optional: SAP Maintenance Planner
- optional: SAP Host Agent
- optional: Hadoop/Spark (see Vora's Spark extensions)

2 Relevant Documentation:

- SUSE
 - SUSE CaaS Platform 3 (https://documentation.suse.com/suse-caasp/3/) 🗗
 - SUSE Enterprise Storage 5.5 (https://documentation.suse.com/ses/5.5/) 🗗

• SAP

- SAP Data Hub (https://help.sap.com/viewer/product/SAP_DATA_HUB/2.6.latest/en-US) **2**
- SAP Data Hub 2.6 release note (https://launchpad.support.sap.com/#/notes/2764652) 🗗
- Pre-requisites for installing SAP Data Hub (https://launchpad.support.sap.com/#/ notes/2686169) **a**
- SAP Data Hub 2: Specific Configurations for Installation on SUSE CaaS Platform (https://launchpad.support.sap.com/#/notes/2776522)

3 Installing SUSE CaaS Platform 3

3.1 Downloading the Installation Media

All installation media can be found at https://download.suse.com ↗.

3.2 Acquiring a Subscription for SUSE CaaS Platform 3

To receive maintenance updates for SUSE products, you need a valid subscription for the respective products. For more information about subscriptions for SUSE CaaS Platform, see https:// www.suse.com/support/?id=SUSE_CaaS_Platform ?.

3.3 Read the Deployment Guide for SUSE CaaS Platform 3

SUSE CaaS Platform is designed to make the installation of Kubernetes easy. For more information on this topic, see the SUSE CaaS Platform 3 *Deployment Guide* from https://documentation.suse.com . For further reference, a *Quick Start Guide* and an *Administrator's Guide* are available as well.

3.4 Installing SUSE CaaS Platform 3

This document describes the installation of SUSE CaaS Platform 3 from ISO images. Make sure that the host names you will use for the installation are resolvable via DNS. A static network setup is preferred.

Have the FQDN or IP address of your time server available. A reliable system time is required. Connect the media to your hardware and boot from the media.

From the GRUB menu, choose Installation.

3.4.1 Installing the Administration Node

1. After initializing the hardware, the YaST installer opens the network configuration dialog:

SUSE.						
Network	Setting	gs				
Overviev			Hostname/DNS	Routing		
Name IP Addre Ethernet Card O Not conf		Note				
Ethernet Card 0 (Not con MAC: 52:54:00:51:63:2d BusID : virtic0 Device Name: eth0						
The device is not configu		configure.				
						<u>N</u> ext

FIGURE 1: NETWORK CONFIGURATION ADMINISTRATION NODE

- 2. On the installation overview screen:
 - Select the keyboard layout and language according to your needs.
 - Specify your subscription credentials or the URL of your SMT/RMT server to register your installation.
 - Set the password for the root account.
 - Assign the role *Administration Node*.

SUSE.		
Installation Overview	Language English (US) Keyboard Layout German Password for root User Confirm Password Registration Code or SMT Server URL	Partitioning
	System Role Administration Node (Dashboard) TP Servers System Information	Network Configuration * STATIC / eth0 Kdump * Kdump status: enabled
		Install

FIGURE 2: INSTALLATION OVERVIEW ADMINISTRATION NODE

3.4.2 Installing the Remaining Cluster Nodes

- 1. Boot the machine from the ISO image and select *Installation* from the GRUB boot menu.
- 2. The installer starts and the network configuration dialog is shown.

SUSE.							
Network Setting	Network Settings						
Overview	Ho <u>s</u> tname/DNS	Ro <u>u</u> ting					
Name IP Address Device I	Note						
Ethernet Card 0 (Not connected) MAC: 52:5400:51:63:2d BuBD: virto0 Device Name: eth0 The device is not configured. Press Edit to cc	nfigure.						
			Abo <u>r</u> t <u>B</u> ack <u>N</u> ext				

FIGURE 3: NETWORK CONFIGURATION CLUSTER NODES

- 3. Configure the network according to your needs.
- 4. On the installation overview screen:
 - Select the keyboard layout and language according to your needs.
 - Specify your subscription credentials or the URL of your SMT/RMT server to register your installation.
 - Set the password for the root account.
 - Assign the role *Cluster Node*.

SUSE.			
Installation Overview		* S * S * B m Password * E * S	artitioning tandard Booting oot Loader Type: GRUB2 nable Trusted Boot: no tatus Location: /dev/vda2 ('/')
	System Role Cluster Node Administration Node	* *s	etwork Configuration TATIC / eth0 Kdump dump status: disabled
			Install

FIGURE 4: INSTALLATION OVERVIEW CLUSTER NODE

3.4.3 Bootstrapping the Kubernetes Cluster

1. After the installation of the administration node, open your browser and visit https:// name.domain.tld.

Sign Up	
•••••	
•••••	
Create Admin	

FIGURE 5: VELUM

2. Create the admin account and set the admin user name and password. Log in with the newly created admin credentials.

SUSE _* CaaS Platform		
SUSE	Log In	
CaaS Platform		
SUSE CaaS Platform allows you to provision, manage, and scale container- based applications.	Log in	
It automates your tedious management tasks allowing you to focus on development and writing apps to meet business goals.	•	
SUSE® CaaS Platform 3.0.0 © SUSE Linux 2019		[®] SUSE.

FIGURE 6: VELUM LOGIN

3. Configure SUSE CaaS Platform 3.

SUSE. CaaS Platform	Logout
Welcome! You have signed up successfully.	×
Initial CaaS Platform Configuration	
Generic settings	
Internal Dashboard Location	0
Cluster services	
Install Tiller (Helm's server component)	
Overlay network settings	Show
Proxy settings	Enable Disable
SUSE registry mirror	Enable Disable
Container runtime 🚯	
The choice of container runtime is completely transparent to end-users of the cluster. Neither Kubernetes manifests nor container images need to be changed.	

FIGURE 7: VELUM CLUSTER CONFIGURATION

4. Select the nodes to be included in the cluster.

ending Nodes	✓ Accept All Node				
Accepting nodes into the cluster might take a while. Be aware that it's not possible to accept a new node while another node is being bootstrapped.					
D	Actions				
ffa92d48cfb4e2895d4009954604810	Accept Reject				
9681728544f4ab582e024f574aac12c	Accept Reject				
35bbd6d9b5c487792e05da746264a11	Accept Reject				
11e312a68ae44fa89dc070d8153143b8	Accept Reject				

FIGURE 8: SELECT NODES AND ROLES 1

5. Assign roles (master/worker) according to your needs.

4 nodes found		•	Select remaining nodes
Please choose an odd number of Master nodes, then click "Select rema	ining nodes" to assign the remaining nodes	to the Worker role.	
ID	Hostname	Role	Actions
29681728544f4ab582e024f574aac12c	cisbwa010	Master Worker Unu	sed Remove
635bbd6d9b5c487792e05da746264a11	cisbwa011	Master Worker Unu	sed Remove
d1e312a68ae44fa89dc070d8153143b8	cisbwa009	Master Worker Unu	sed Remove
1ffa92d48cfb4e2895d4009954604810	cisbwa012	Master Worker Unu	sed Remove
			Back Next

FIGURE 9: SELECT NODES AND ROLES 2

6. Bootstrap the Kubernetes cluster.

Logout
θ
Θ
Back Bootstrap cluster

FIGURE 10: CONFIRM BOOTSTRAP

7. After a successful bootstrap, the screen below is shown.

SUSE₀ Ca	aaS Platf	orm Home	Settings			Logout
Cluster	Status					
Summary						
Total nodes Master node: Unassigned r				Updates # of nodes w/ outdated software	Manual O	
Nodes						+ Add node 🔺 kubeconfig
Online	Applied	ID		Hostname	Role	Actions
٠	\odot	29681728544f4ab	582e024f574aac12c		work	er Remove
•	\odot	635bbd6d9b5c487	792e05da746264a11		work	er Remove
•	\odot	d1e312a68ae44fa	39dc070d8153143b8		🗹 mast	er
٠	0	1ffa92d48cfb4e28	95d4009954604810		work	er Remove
Pending No	des					✓ Accept All Nodes
You currently	have no nodes	to be accepted for boo	tstrapping.			
			SUSE® Caa	IS Platform 3.0.0 © SUSE Linux 2019		

FIGURE 11: CLUSTER STATUS NODES

3.4.4 Installing the Jump Host

For further configuration and deployments on SUSE CaaS Platform it is highly recommended to install a jump host, also called a *management host*. This section describes installing the necessary tools to be able to deploy SAP Data Hub 2 on SUSE CaaS Platform.

- 1. Install SUSE Linux Enterprise Server 12 SP4+ or SUSE Linux Enterprise Server 15 as the operating system on the jump host.
- 2. Register your installation against the SUSE Customer Center (SCC) or your local SMT (Subscription Management Tool) or RMT (Repository Mirroring Tool).
- 3. Register the Container Module included in the SUSE Linux Enterprise Server subscription:

```
# SUSEConnect -p x86_64/SLE-Container-Module
```

4. Install Docker from the Container Module:

```
# zypper in docker
```

5. Download **kubectl** matching the Kubernetes version of your SUSE CaaS Platform installation. Download **kubectl 1.10.11** or higher.

```
$ curl -L0 https://storage.googleapis.com/kubernetes-release/release/v1.10.11/bin/
linux/amd64/kubectl
$ sudo mv kubectl /usr/bin/kubectl
$ sudo chmod a+x /usr/bin/kubectl
```

6. Download the kubeconfig file from the Velum Dashboard. Click the button *kubeconfig*, log in to CaaS Platform, and accept the file download.

manuai O				
		+ Add no	de	≛ kubeconfig
	Role		Acti	ons
	worke	r	Rem	ove

FIGURE 12: KUBECONFIG BUTTON

username
Login

FIGURE 13: LOGGING IN TO CAAS PLATFORM

r		Opening kubeconfig	×
	You have chosen to	open:	
pa	kubeconfig		
e	which is: YAML from: https://c	. document sbwa008.wdf.sap.corp	
EC	What should Firefo	ox do with this file?	t
./.	Open with	Text Editor (default)	-
ica	● <u>S</u> ave File		
k	Do this <u>a</u> uto	matically for files like this from now on.	
se			
		Cancel OK	

FIGURE 14: DOWNLOADING KUBECONFIG

- 7. Enable the downloaded kubeconfig by doing either of the following:
 - Configure the KUBECONFIG environment variable:

\$ export KUBECONFIG=<PATH/T0/YOUR/kubeconfig-file>/kubeconfig

• Move it to default path:

\$ mv <PATH/T0/YOUR/kubeconfig-file>/kubeconfig ~/.kube/config

8. Connect to your Kubernetes cluster using kubectl:

```
$ kubectl get cluster-info
Kubernetes master is running at https://spwdfvml2054.example.com:6443
Dex is running at https://spwdfvml2054.example.com:6443/api/v1/namespaces/kube-
system/services/dex:dex/proxy
KubeDNS is running at https://spwdfvml2054.example.com:6443/api/v1/namespaces/kube-
system/services/kube-dns:dns/proxy
kubernetes-dashboard is running at https://spwdfvml2054.example.com:6443/api/v1/
namespaces/kube-system/services/https:kubernetes-dashboard:https/proxy
Tiller is running at https://spwdfvml2054.example.com:6443/api/v1/namespaces/kube-
system/services/tiller:tiller/proxy
```

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.

\$ kubectl get nodes NAME STATUS ROLES AGE VERSION spwdfvml2054 Ready master 301d v1.10.11

spwdfvml2055	Ready	<none></none>	301d	v1.10.11
spwdfvml2056	Ready	<none></none>	301d	v1.10.11
spwdfvml2082	Ready	<none></none>	301d	v1.10.11

9. Download Helm from https://helm.sh <a>?. Install and configure the Helm client. The version should match the Tiller version deployed on your SUSE CaaS Platform installation.

```
$ curl https://raw.githubusercontent.com/helm/helm/master/scripts/get > get_helm.sh
$ chmod 700 get_helm.sh
$ ./get_helm.sh --version 2.8.2
$ mv helm ~/bin/helm
$ helm init --client-only
```

3.4.5 Deploying Optional Components in the SUSE CaaS Platform 3 Cluster

You can deploy some useful optional applications in your SUSE CaaS Platform 3 cluster:

- Heapster allows analyzing cluster performance
- The Kubernetes dashboard allows administrating and basic monitoring of the Kubernetes cluster

See also https://documentation.suse.com/suse-caasp/3/html/caasp-admin/ 2.

1. Install Heapster:

```
$ helm install --name heapster-default --namespace=kube-system stable/heapster \
    --version=0.2.7 --set rbac.create=true
```

2. Install the Kubernetes dashboard:

```
$ helm install --namespace=kube-system \
    --name=kubernetes-dashboard stable/kubernetes-dashboard \
    --version=0.6.1
```

3. Start the Kubernetes API proxy:

```
$ kubectl proxy
```

4. Extract the **id-token** from the **kubeconfig** file:

```
$ grep id-token $KUBECONFIG | awk '{ print $2 }'
```

This token will allow you to log in in the next step.

5. In your browser, open <u>http://127.0.0.1:8001/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/</u>. Use the ID you found in **kubeconfig** to log in to the Kubernetes dashboard.

4 Installing SAP Data Hub 2

The following sections describe the preparation and installation of SAP Data Hub 2 on the SUSE CaaS Platform 3 Cluster.

4.1 Preparing the SAP Data Hub 2 Installation

To install SAP Data Hub on SUSE CaaS Platform successfully, perform the actions detailed below.

4.1.1 Downloading the SAP Data Hub 2 Software Archive

- Log in to SAP Launchpad Software Center at https://launchpad.support.sap.com/#/softwarecenter
 ¬, select *Installations and Downloads*, select alphabetical order, and choose the letter D. Scroll down in the list to the folder SAP Data Hub, open it and select the version to be installed.
- 2. Download the SAP Data Hub Foundation file, for example: DHFOUN-DATION03_3-80004015.ZIP (SAP DATA HUB - FOUNDATION 2.3) or DHFOUN-DATION06_1-80004015.ZIP (SAP DATA HUB - FOUNDATION 2.6)
- 3. Unzip the software archive onto your jump host.

There are two ways to install SAP Data Hub 2:

- Use the SL Plugin. There are two variants of doing so:
 - SL Plugin with Maintenance Planner (mpsl)
 - SL Plugin only (mpfree)
- Use the command line install.sh script.

This document will focus on the latter installation method.

4.1.2 Prerequisites on the SUSE CaaS Platform 3 Cluster

Where not stated otherwise, all of the following steps need to be performed on the jump host.

- 1. Create the namespace in the Kubernetes cluster to install SAP Data Hub 2:
 - \$ kubectl create namespace datahub
- 2. On SUSE Enterprise Storage, create the storage class to provide volumes for SAP Data Hub 2.
- 3. Make sure you have the connection data for your SUSE Enterprise Storage at hand:
 - IP addresses and port number (defaults to 6789) of the monitor nodes of your SUSE Enterprise Storage
 - A data pool created (data hub in this example) on your SUSE Enterprise Storage for the use with SAP Data Hub 2
- 4. Edit the example below to fit your environment.

```
$ cat > storageClass.yaml <<EOF</pre>
apiVersion: storage.kubernetes.io/v1
kind: StorageClass
metadata:
 annotations:
    storageclass.kubernetes.io/is-default-class: "true"
 name: datahub
 namespace: default
parameters:
 adminId: admin
 adminSecretName: ceph-admin-secret
 adminSecretNamespace: default
 imageFeatures: layering
 imageFormat: "2"
 monitors: <IP ADDRESS OF MONITOR 1>:6789, <IP ADDRESS OF MONITOR 2>:6789, <IP
ADDRESS OF MONITOR 3 >:6789
 pool: datahub
 userId: admin
 userSecretName: ceph-user-secret
provisioner: kubernetes.io/rbd
reclaimPolicy: Delete
volumeBindingMode: Immediate
```

```
EOF
```

```
$ kubectl create -f storageClass.yaml
```

- 5. Create the secrets needed to access the storage.
 - a. From SUSE Enterprise Storage, obtain the keys located in <u>ceph.admin.keyring</u> and ceph.user.keyring.
 - b. Base64-encode the keys as follows:

```
$ echo <YOUR KEY HERE> | base64
```

c. Configure the encoded secrets:

```
$ cat > ceph-admin-secret.yaml <<EOF</pre>
apiVersion: v1
kind: Secret
metadata:
   name: ceph-admin-secret
type: "kubernetes.io/rbd"
data:
   key: <YOUR BASE64 ENCODED KEY HERE>
E0F
image::002-SCT-CaaSP.png
$ cat > ceph-user-secret.yaml <<EOF</pre>
apiVersion: v1
kind: Secret
metadata:
   name: ceph-user-secret
type: "kubernetes.io/rbd"
data:
   key: <YOUR BASE64 ENCODED KEY HERE>
E0F
$ kubectl create -f ceph-admin-secret.yaml
$ kubectl create -f ceph-user-secret.yaml
```

4.2 Installation of SAP Data Hub 2 Using the Maintenance Planner with SL Plugin (mpsl Method)

The installation method via SL plugin is a Web-based installation method recommended by SAP, offering you an option to send analytics data and feedback to SAP. All necessary prerequisites are met by applying all the steps described above.



Important

You need to install the latest SAP Host Agent on the jump host. You can use the RPM package which can be downloaded from the SAP Software Download Center.

4.3 Installing SAP Data Hub 2 Using the SL Plugin (mpfree Method)

The Installation of SAP Data Hub 2 using the SL plugin is an alternative command-line-based installation method. Refer to the SAP Data Hub documentation (2.3) / (2.4) / (2.5) / (2.6) for more information and the exact procedure.

4.4 Installing SAP Data Hub 2 from the Command Line (Manual Installation)

1. Unpack the SAP Data Hub 2.6 software archive on the jump host with the following command:

\$ unzip DHFOUNDATION06_1-80004015.ZIP

- 2. Run the install command as described in SAP Data Hub 2 install guide at https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.6.latest/en-US **?**.
 - \$ cd SAP-Datahub-2.4.63-Foundation
 \$ export DOCKER_REGISTRY=<URI of your registry>
 \$ export NAMESPACE=datahub
 \$./install.sh

This interactive script configures the installation of SAP Data Hub. You should have the following information at a hand:

- Name and credentials of your SAP S-User
- Login credentials to your secure registry

4.5 Post-Installation Actions

After successful installation you can connect to the SAP Data Hub Web UI, identify the service IP and port of the SAP Data Hub UI:

\$ kubectl get services
\$ kubectl describe service

Point your browser to the IP and port you received from the commands above.

Use the login data you defined during the installation.

4.5.1 Post-Installation Work

Follow the documentation provided by SAP (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.6.latest/en-US/4c472c40595b450283a6ce039f71cfc6.html **?**) to the post installation work.

- Create the **vflow-secret** for the modeler app as pointed out in the SAP documentation.
- Import necessary CAs, for example, the CA that signed the certificate of the secure registry.

5 Upgrading SAP Data Hub 2

To upgrade an existing SAP Data Hub 2 installation to a higher version (for example 2.3 to 2.4), follow the official instructions from SAP. You can choose between the following upgrade methods:

- Maintenance Planner: Upgrade SAP Data Hub 2 using the Maintenance Planner / SL Plugin and SAP Host Agent (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.6.latest/en-US/31079833a65f4f379d5a76957ff8073c.html ?)
- SL Plugin method: Upgrade SAP Data Hub 2 using the SL Plugin and SAP Host Agent (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.6.latest/en-US/ ff37f3ccf6504bb38d7db53936fe8017.html ?)
- Command line method: Upgrade SAP Data Hub 2 using the install.sh script (https://help.sap.com/viewer/e66c399612e84a83a8abe97c0eeb443a/2.6.latest/en-US/ aec679bc0209443ba4ae03a9018d4bd8.html ?)

6 Appendix

6.1 Installing a Secure Private Docker Registry

To meet the Data Hub requirements you also need a Docker Registry. The Portus project provides an easy way to build and manage an own Docker Registry. For more information, see the project homepage at http://port.us.org/ 2.

To set up Portus in a dedicated virtual machine, do:

1. Create a suitable a virtual machine:

```
# sudo virt-install --name portus-dr --ram 8192 \
    --disk path=/var/lib/libvirt/VMS/portus-dr.qcow2,size=40 --vcpus 4 \
    --os-type linux --os-variant generic --network bridge=common --graphics none \
    --console pty,target_type=serial \
    --location '/var/lib/libvirt/isos/SLE-12-SP4-Server-DVD-x86_64-GM-DVD1.iso' \
    --extra-args 'console=ttyS0,115200n8 serial
    ifcfg=eth0=10.10.10.11/24,10.10.10.11,10.10.11,suse-sap.net hostname=portus-dr
    domain=suse-sap.net Textmode=1'
```

2. In this example, the Portus server will be connected to a local bridge providing common services (DNS, SMT, and Docker Registry) for the SAP Data Hub 2 stack. Our Portus deployment is container-based and orchestrated locally with <u>docker-compose</u>. Portus <u>dock-er-compose</u> deployment requires an up-to-date release of <u>docker-compose</u>. To install docker-compose, use:

```
# sudo curl -L "https://github.com/docker/compose/releases/download/1.24.1/docker-
compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose
# sudo chmod +x /usr/local/bin/docker-compose
# sudo ln -s /usr/local/bin/docker-compose /usr/bin/docker-compose
```

3. Clone the Portus Git repository:

```
# git clone https://github.com/SUSE/Portus.git /tmp/Portus-DR
# mv /tmp/Portus-DR/examples/compose ./portus
# cd portus
```

4. Adapt the configuration in the <u>.env</u>. As an example, a valid configuration may look like this:

cat .env

```
MACHINE_FQDN=portus-dr.suse-sap.net
SECRET_KEY_BASE=b494a25faa8d22e430e843e220e424e10ac84d2ce0e64231f5b636d21251
eb6d267adb042ad5884cbff0f3891bcf911bdf8abb3ce719849ccda9a4889249e5c2
PORTUS_PASSWORD=XXXXXXX
DATABASE_PASSWORD=YYYYYYYY
```

5. In the nginx/nginx.conf file, adapt the following section:

```
server {
    listen 443 ssl http2;
    server_name portus-dr.suse-sap.net;
    root /srv/Portus/public;
```

6. Download the latest docker-compose.yml for Portus:

```
# rm docker-compose.*
# wget https://gist.githubusercontent.com/Patazerty/
d05652294d5874eddf192c9b633751ee/raw/6bf4ac6ba14192a1fe5c337494ab213200dd076e/
docker-compose.yml
```

7. To secure your Docker Registry configuration, add TLS to your setup:

```
# echo "subjectAltName = DNS:portus-dr.suse-sap.net" > extfile.cnf
# openssl genrsa -out secrets/rootca.key 2048
# openssl req -x509 -new -nodes -key secrets/rootca.key -subj "/C=FR/ST=FR/0=SUSE" \
    -sha256 -days 1024 -out secrets/rootca.crt
# openssl genrsa -out secrets/portus.key 2048
# openssl req -new -key secrets/portus.key -out secrets/portus.csr \
    -subj "/C=FR/ST=FR/0=SUSE/CN
# openssl req -new -key secrets/portus.key -out secrets/portus.csr \
    -subj "/C=FR/ST=FR/0=SUSE/CN=portus-dr.suse-sap.net"
# openssl x509 -req -in secrets/portus.csr -CA secrets/rootca.crt \
    -extfile extfile.cnf -CAkey secrets/rootca.key -CAcreateserial \
    -out secrets/portus.crt -days 500 -sha256
```

8. Make the servers aware of the new certificate:

```
# cp -p secrets/rootca.crt /etc/pki/trust/anchors/.net-ca.crt
# scp secrets/rootca.crt root@jumpbox.suse-sap.net:/etc/pki/trust/anchors/portus-
dr.suse-sap.net-ca.crt
```

9. Update the certificate on all servers that will need to interact with the Docker registry:

```
# sudo update-ca-certificates
# sudo systemctl restart docker
```

10. Start your Portus setup with the following command:

docker-compose up -d

11. Log in to Portus and set up the registry as shown below:

← → ♂ ☆	Q, https://portus-dr.suse-sap.net/admin/registries/1/edit		III\ 🗊 🛎 =
Portus 🗗		Search	Q 🇰 admin 🕞
🚯 Dashboard	Registry: registry		
🚊 Namespaces	Name registry		
Repositories	Hostname portus-dr.suse-sap.net:5000 Use SSL		
👑 Teams	Save Show Advanced		
🐣 Users			
🚔 Registries	K		
C Help			

FIGURE 15: PORTUS REGISTRY

12. To install and configure a secure private registry using SUSE Linux Enterprise Server with the Container Module, the necessary components are Docker, Docker Registry, and Portus. Create SSL certificates as needed. Distribute the CA certificate to all your Kubernetes nodes. Run the command:

```
# update-ca-certificates
# systemctl restart docker
```

- 13. Create the namespaces on your registry that are needed for SAP Data Hub 2:
 - com.sap.hana.container
 - com.sap.datahub.linuxx86_64
 - com.sap.datahub.linuxx86_64.gcc6
 - consul
 - elasticsearch

- fabric8
- google_containers
- grafana
- kibana
- prom
- vora
- kaniko-project
- com.sap.bds.docker

6.2 SUSE Enterprise Storage

An SAP Data Hub 2 installation on premise requires SUSE Enterprise Storage 5 or higher. If you plan to use SUSE Enterprise Storage not only for your Kubernetes dynamic storage class but also for your Kubernetes Control plan, virtualized or not, reserve enough resources to address <u>etcd</u> requirements regarding etcd Hardware (https://github.com/etcd-io/etcd/blob/master/Documenta-tion/op-guide/hardware.md) **?**.

The following steps show a minimalist, virtualized, test-oriented deployment of SUSE Enterprise Storage 5.5.

In the following example, we are going to build a 4 nodes (1 admin + 3 OSD) Ceph Cluster. Before you start, be sure to:

- Collect your SUSE Linux Enterprise Server 12 SP3 and SUSE Enterprise Storage 5 registration code from https://scc.suse.com . Alternatively, have an SMT/RMT properly set up and already mirroring these products.
 - SCC (https://scc.suse.com) **才**
 - SMT (https://documentation.suse.com/sles-12/html/SLES-all/book-smt.html)

SUSE Customer Center		🔀 suse.com 🕜 Help 🌐 English 🗸 😫
INTERNAL TOOLS	Products > SUSE Li	nux Enterprise Server 15 SP1 x86_64 released
Products		
	Available	aarch64 ppc64le s390x x86_64
	Release schedule	beta Dec 14 2018
		released Jun 21 2019
	Туре	Base Module Extension
MY ORGANIZATIONS (2)	Product Class	7261
	Requires Regcode	Yes
<u></u>	EULA	https://updates.suse.com/SUSE/Products/SLE-Product-SLES/15-SP1/x86_64/product.license/
	Description	SUSE Linux Enterprise offers a comprehensive suite of products built on a single code base. The
		platform addresses business needs from the smallest thin-client devices to the world's most powerful high-performance computing and mainframe servers. SUSE Linux Enterprise offers common
		management tools and technology certifications across the platform, and each product is
Connect to an organization		enterprise-class.
es connect to an organization		Show technical details
Manage my organizations	Still supported?	Yes 🜖
	Trial product code	No trial offered
	Download information	Show download information
	Installation media	Show installation media
	Extensions	SUSE CaaS Platform 4.0
MY TOOLS		SUSE Enterprise Storage 6
10013		SUSE Linux Enterprise High Availability Extension 15 SP1 SUSE Linux Enterprise Live Patching 15 SP1
🞧 Support		SUSE Linux Enterprise Server LTSS 15 SP1
Activate subscriptions		SUSE Linux Enterprise Workstation Extension 15 SP1
		SUSE Package Hub 15 SP1
Packages	Modules	Basesystem Module 15 SPI recommended Containers Module 15 SPI
Ratches		Desktop Applications Module 15 SP1 added in migration
Container Images		Development Tools Module 15 SP1 added in migration Legacy Module 15 SP1 added in migration
0		Public Cloud Module 15 SP1
		Python 2 Module 15 SP1 added in migration
		SUSE Cloud Application Platform Tools Module 15 SPI
		Server Applications Module 15 SP1 recommended Transactional Server Module 15 SP1
		Web and Scripting Module 15 SP1 added In migration
SUSE		
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Privacy and Cookie Policy		SUSE Linux Enterprise Server 15 online

FIGURE 16: SUSE CUSTOMER CENTER PRODUCTS

SUSE Customer Center		🔀 suse.com 🕜 Help 🌐 English 🗸 🔒
INTERNAL TOOLS	Products > SUSE Li	nux Enterprise Server 15 SP1 x86_64 released
Products		
	Available	aarch64 ppc64le s390x x86_64
	Release schedule	beta Dec 14 2018
		released Jun 21 2019
	Туре	Base Module Extension
MY ORGANIZATIONS (2)	Product Class	7261
	Requires Regcode	Yes
	EULA	https://updates.suse.com/SUSE/Products/SLE-Product-SLES/15-SP1/x86_64/product.license/
	Description	SUSE Linux Enterprise offers a comprehensive suite of products built on a single code base. The
		platform addresses business needs from the smallest thin-client devices to the world's most
		powerful high-performance computing and mainframe servers. SUSE Linux Enterprise offers common management tools and technology certifications across the platform, and each product is
		enterprise-class.
Connect to an organization		Show technical details
Manage my organizations	Still supported?	Yes 🕕
	Trial product code	No trial offered
	Download information	Show download information
	Installation media	Show installation media
	Extensions	SUSE CaaS Platform 4.0
MY TOOLS		SUSE Enterprise Storage 6
-		SUSE Linux Enterprise High Availability Extension 15 SP1 SUSE Linux Enterprise Live Patching 15 SP1
🔒 Support		SUSE Linux Enterprise Server LTSS 15 SP1
Activate subscriptions		SUSE Linux Enterprise Workstation Extension 15 SP1
		SUSE Package Hub 15 SP1
Packages	Modules	Basesystem Module 15 SPI recommended Containers Module 15 SPI
Patches		Desktop Applications Module 15 SP1 added In migration
Container Images		Development Tools Module 15 SP1 added in migration
Container infuges		Legacy Module 15 SP1 added in migration Public Cloud Module 15 SP1
		Python 2 Module 15 SP1 added in migration
		SUSE Cloud Application Platform Tools Module 15 SP1
		Server Applications Module 15 SP1 recommended
		Transactional Server Module 15 SP1 Web and Scripting Module 15 SP1 added in migration
SUSE		
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Privacy and Cookie Policy	-	SUSE Linux Enterprise Server 15. online

FIGURE 17: SUSE CUSTOMER CENTER REGISTRATION CODE

• Your DNS zone should already be set. In our example, where all Data Hub components are in the same DNS zone and subnet, it should look similar to the following:

[Ac	ge] d]
	ete]

FIGURE 18: DNS SERVER

• Also, to be as efficient as possible when using an interactive shell-scripted infrastructure deployment, we recommend using an advanced terminal client or multiplexer which allows addressing multiple shells at once.

ar/lib/lib/it/1/MK/ses55-admin.gcow2,size=40disk bus=virtio.pdth=/var/lib/lib/it/ MS/ses55-admin.osd0.gcow2,size=20disk bus=virtio.pdth-/var/lib/lib/it/virt/WK/ses55-admin-osd2.gco min-osd1.gcow2,size=20disk bus=virtio.pdth-/var/lib/lib/it/virt/WK/ses55-admin-osd2.gco w2,size=20disk bus=virtio.pdth-/var/lib/lib/it/VK/ses55-admin-osd2.gco size=20disk bus=virtio.pdth-/var/lib/lib/it/VK/ses55-admin-osd2.gco size=20disk bus=virtio.pdth-/var/lib/lib/it/VK/ses55-admin-osd2.gco size=20disk bus=virtio.pdth-/var/lib/lib/it/VK/ses55-admin-osd2.gco vorse1disk bus=virtio.pdth-/var/lib/lib/it/vK/ses55-admin-osd2.gco vorse1disk bus=virtio.pdth-/var/lib/lib/it/VK/ses55-admin-osd2.gco vorse1disk bus=virtio.pdth-/var/lib/lib/lib/it/ses55-admin-osd2.gco vorse1disk bus=virtio.pdth-/var/lib/lib/lib/lib/lib/lib/lib/lib/lib/lib	→ — ssh root#810.10.10.10.10.10.10.10.10.10.10.10.10.1
× root@10.10.10.103 (ssh)	× root@10.10.103 (ssh)
<pre>//lib/lib/rt/VMS/ses55-osd1.qcow2.size-40disk bus-virt0.path-/var/lib/lib/rt/VMS /ses5-osd1-osd0.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/VMS/ses5-osd1-osd2.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/VMS/ses55-osd1-osd2.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/VMS/ses55-osd1-osd2.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/VMS/ses55-osd1-osd2.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/VMS/ses55-osd1-osd2.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/MS/ses55-osd1-osd2.qcow2.size-20disk bus-virt0.path-/var/lib/lib/rt/MS/ses55-osd1-osd2.qcow2.size-1b/p/140</pre>	→ - ssh rootE01.01.01.01.03 Last Lagin: Hu Oct 71 25x2:22 2019 from 10.10.8.2 Unndec: # sudo virt-installname ses55-osd2nam 16384disk bus=virtio.path=/va 711b/1bivirt/WMS/ses55-osd2.cow2,size=40disk bus=virtio.path=/var/lib/1bivirt/WMS/ses55-osd2_add, /ses55-osd2-osd0.qcow2,size=20disk bus=virtio.path=/var/lib/1bivirt/WMS/ses55-osd2_add, add, add, size=20disk bus=virtio.path=/var/lib/1bivirt/WMS/ses55-osd2-add, acow2, size=20disk bus=virtio.path=/var/lib/1bivirt/WMS/ses55-osd2-add, acow2, size=20vcp us 4ostybe linuxos-variant genericnetwork birdge=causp3adpbits noneco nes6-pdy,barget_Upeserialcotion /bar/lib/1bivirt/WMS/ses55-sed2-add, acow2, size=20vcp 10.10.30.101/unit/unit/size=20disk bissevirtio.path=/var/lib/1bivirt/WMS/ses55-osd2-add, acow2, size=20vcp .os6-pdy,barget_Upeserialcotion /bar/lib/1bivirt/MS/ses55-sed2-add, acow2, size=20vcp .01.01.01.01/unit/unit/size=55 iff5g=etMe=10.18.10.232/24, 10.18.10.1,10.10.10.11,suse=sap.net t domain=suse=sap.net Textmode=1/

FIGURE 19: ADVANCED TERMINAL CLIENT - MULTI-SHELL

1. Create virtual machines:

sudo virt-install --name ses55-admin --ram 16384 --disk bus=virtio,path=/ var/lib/libvirt/VMS/ses55-admin.qcow2,size=40 --disk bus=virtio,path=/var/ lib/libvirt/VMS/ses55-admin-osd0.qcow2,size=20 --disk bus=virtio,path=/ var/lib/libvirt/VMS/ses55-admin-osd1.qcow2,size=20 --disk bus=virtio,path=/ var/lib/libvirt/VMS/ses55-admin-osd2.qcow2,size=20 --disk bus=virtio,path=/ var/lib/libvirt/VMS/ses55-admin-osd3.qcow2,size=20 --disk bus=virtio,path=/ var/lib/libvirt/VMS/ses55-admin-osd3.qcow2,size=20 --vcpus 4 -os-type linux --os-variant generic --network bridge=caasp3 -graphics none --console pty,target_type=serial --location '/var/lib/ libvirt/ISOS/SLE-12-SP3-Server-DVD-x86_64-GM-DVD1.iso' --extra-args 'console=ttyS0,115200n8 serial autoyast-ses5=http://10.10.10.101/autoyast-ses5 ifcfg=eth0=10.18.10.200/24,10.18.10.1,10.10.10.11,suse-sap.net domain=susesap.net Textmode=1'

sudo virt-install --name ses55-osd0 --ram 16384 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0.qcow2,size=40 --disk bus=virtio,path=/var/
lib/libvirt/VMS/ses55-osd0-osd0.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0-osd2.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0-osd2.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0-osd3.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0-osd3.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0-osd3.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd0-osd3.qcow2,size=20 --vcpus 4 --ostype linux --os-variant generic --network bridge=caasp3 --graphics
none --console pty,target_type=serial --location '/var/lib/
libvirt/ISOS/SLE-12-SP3-Server-DVD-x86_64-GM-DVD1.iso' --extra-args
'console=ttyS0,115200n8 serial autoyast-ses5=http://10.10.10.101/autoyast-ses5
ifcfg=eth0=10.18.10.230/24,10.18.10.1,10.10.11,suse-sap.net domain=susesap.net Textmode=1'

sudo virt-install --name ses55-osd1 --ram 16384 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1.qcow2,size=40 --disk bus=virtio,path=/var/
lib/libvirt/VMS/ses55-osd1-osd0.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1-osd2.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1-osd2.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1-osd3.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1-osd3.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1-osd3.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd1-osd3.qcow2,size=20 --vcpus 4 --ostype linux --os-variant generic --network bridge=caasp3 --graphics
none --console pty,target_type=serial --location '/var/lib/
libvirt/ISOS/SLE-12-SP3-Server-DVD-x86_64-GM-DVD1.iso' --extra-args
'console=ttyS0,115200n8 serial autoyast-ses5=http://10.10.10.101/autoyast-ses5
ifcfg=eth0=10.18.10.231/24,10.18.10.1,10.10.11,suse-sap.net domain=susesap.net Textmode=1'

sudo virt-install --name ses55-osd2 --ram 16384 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd2.qcow2,size=40 --disk bus=virtio,path=/var/
lib/libvirt/VMS/ses55-osd2-osd0.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd2-osd1.qcow2,size=20 --disk bus=virtio,path=/
var/lib/libvirt/VMS/ses55-osd2-osd2.qcow2,size=20 --disk bus=virtio,path=/

var/lib/libvirt/VMS/ses55-osd2-osd3.qcow2,size=20 --vcpus 4 --ostype linux --os-variant generic --network bridge=caasp3 --graphics none --console pty,target_type=serial --location '/var/lib/ libvirt/ISOS/SLE-12-SP3-Server-DVD-x86_64-GM-DVD1.iso' --extra-args 'console=ttyS0,115200n8 serial autoyast-ses5=http://10.10.10.101/autoyast-ses5 ifcfg=eth0=10.18.10.232/24,10.18.10.1,10.10.10.11,suse-sap.net domain=susesap.net Textmode=1'

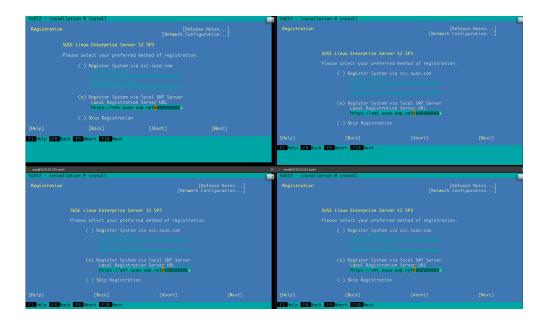


FIGURE 20: MULTI SHELL SMT

2. Select the SUSE Enterprise Storage 5 Extension.

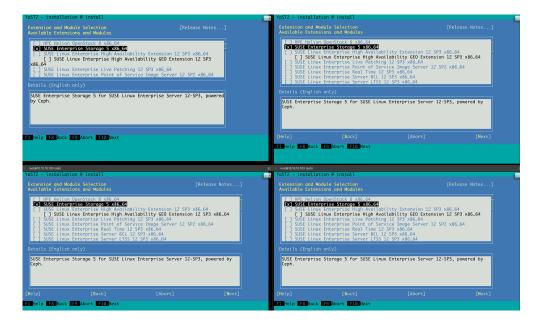


FIGURE 21: MULTI SHELL EXTENSIONS AND MODULES

- 3. On the hypervisor, you should also be able to route or bridge (either a traditional bridge using <u>brctl</u> or a virtual bridge) your upcoming SUSE Enterprise Storage 5.5 network segment. In our example, for simplicity, we are using the same bridge and network address as the SUSE CaaS Platform cluster, --network bridge=caasp3.
- 4. In the following example, each node is powered by 16 GB of RAM, 4 VCPU, 40 GB for the root disk, 4 * 20GB OSDB disk.

raST2 - installation	n∉install			YaST2 - installa			
				System Role			
	s are predefined use ected scenario.				m Roles are predefined u: he selected scenario.		
(x) Default * GNOME er * Separate	wironment, with Btr	fs root (/) partition FS) for disks larger th		· • 6	Default System NOME environment, with B ieparate ∕home partition (
Kernel-t	ualization Host based hypervisor and rate /home partition			С 14 к	CVM Virtualization Host Gernel-based hypervisor a No separate /home partition	nd tools on	
	ualization Host al hypervisor and to ate /home partition				Cen Virtualization Host Dare metal hypervisor and No separate /home partitie		
			[Next]				
F1 Help F8 Back F9	Abort F10 Next			[Help]			[Next]
root#10.15.10.103 (sah)					x F9 Abort F10 Next		
	n @ install	_	_	F1 Help F8 Back			
	ı⊛install	_	[Release Notes]	= × roch@10.10.10.303 (ssh)		[Ri	elease Notes]
YaST2 - installation System Role System Ro		use cases which tailor		× reed@0010.10.00 (meb) YaST2 - installa System Role Syste	ition ∉ install	[R4 se cases which tailor the :	
YaST2 - installation System Role System Ro for the s (x) Defat GROM	ples are predefined (selected scenario, alt System : environment, with (use cases which tailor Btrfs root (/) partiti (XFS) for disks larger		X reversion 10.10.20 (net) Ya5T2 - installa System Role Syste for t (x) E	ition @ install m Roles are predefined u the selected scenario. hefault System NMME environment. with B		
YaST2 - installation System Role System Ro for the s (x) Defai GROMM * Span () KVM V Kerna	ples are predefined (selected scenario, alt System : environment, with (■ < rendplitition (new) YSST2 - installe System Role System Conference System	ition @ install m Roles are predefined u the selected scenario. hefault System NMME environment. with B	- se cases which tailor the : trfs root (/) partition (XFS) for disks larger than nd tools	
YaST2 - installation System Role System Role (*) Defa (*) Defa (*) Office (*) KWM (*) Kerni * Kerni * No st Bare Bare	bles are predefined i selected scenario. it System i environment, with f rate /home partition /irtualization Host il-based hypervisor.	Btrfs root (/) partitic (XFS) for disks larger and tools ion d tools		Control to the law of the second seco	tion @ install em Roles are predefined u he selected scenario. befault System Now environment, with B eparate //one partition / W Virbualization Host	se cases which tailor the s tefs root (/) partition XFS) for disks larger than nd tools tools	
YaST2 - installation System Role System Role (*) Defa (*) Defa (*) Office (*) KWM (*) Kerni * Kerni * No st Bare Bare	bles are predefined i letected scenario. At System environment, with I ate /home partition /irtualization Host 1-based hypervisor parate /home partit /irtualization Host metal hypervisor an	Btrfs root (/) partitic (XFS) for disks larger and tools ion d tools		Control to the law of the second seco	tion ∉ install m Roles are predefined u the selected scenario. Prolat System NOME environment, with B Provision and a station of the perfect Anage partition House Josef Dypervisor of the metal hypervisor of the metal hypervisor of	se cases which tailor the s tefs root (/) partition XFS) for disks larger than nd tools tools	

FIGURE 22: MULTI-SHELL DEFAULT SYSTEM

5. NTP must be configured on each node.

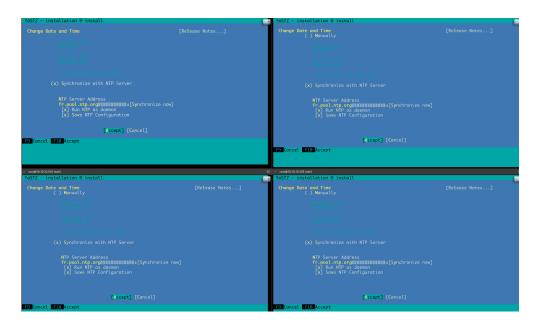
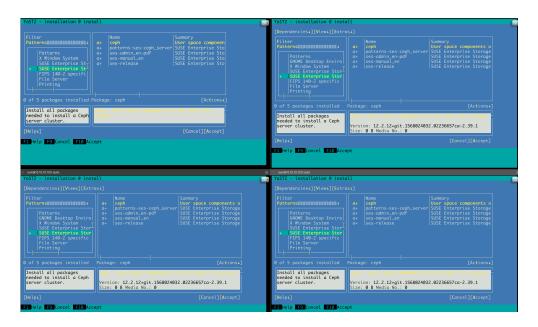


FIGURE 23: MULTI-SHELL NTP SERVER

6. Deselect AppArmor and unnecessary X and GNOME Patterns, but select the SUSE Enterprise Storage pattern.





7. Deactivate the firewall on the nodes. Start the installation on all nodes.

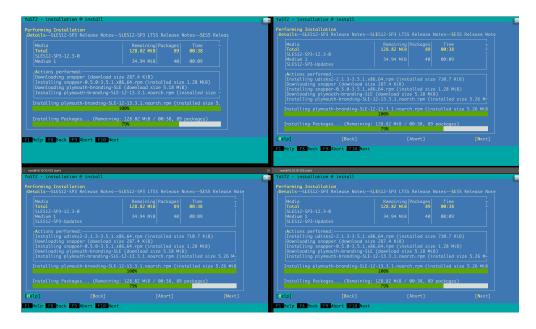


FIGURE 25: MULTI-SHELL INSTALLATION

8. When the nodes are rebooted, log in and finish the network/host name and NTP configurations so that <u>hostname -f</u> returns the FQDN of the nodes and <u>ntpq -p</u> returns a stratum less than 16.

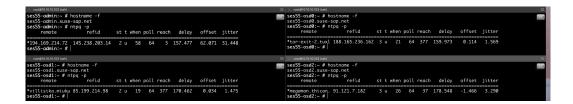


FIGURE 26: MULTI-SHELL HOST NAME

- 9. Using <u>ssh-keygen</u> and then <u>ssh-copy-id</u>, send your SUSE Enterprise Storage administration node SSH public key to all other nodes.
- 10. Verify that the drives you are going to allocate for SUSE Enterprise Storage OSDs are clean by wiping them. For more information, see SES Deployment Guide, section 4.3, step 12, Wipe disk (https://documentation.suse.com/ses/5.5/html/ses-all/ceph-install-saltstack.html#ceph-install-stack) .
- 11. Install salt-minion on all nodes (including the administration node).
- 12. On the administration node (in our example, <u>ses55-admin.suse-sap.net</u>), additionally install salt-master and deepsea.

13. Restart salt-minion on all nodes and salt-master on the administration node.

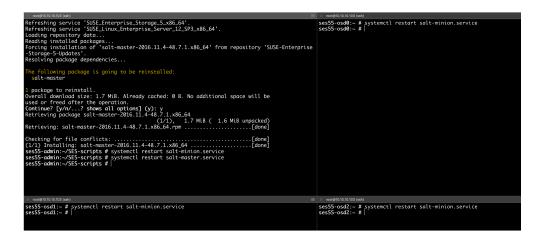


FIGURE 27: MULTI-SHELL SALT INSTALLATION

14. Accept related pending Salt keys:

```
# salt-key -L
Accepted keys:
ses55-admin.suse-sap.net
ses55-osd0.suse-sap.net
ses55-osd2.suse-sap.net
Denied keys:
Unaccepted keys:
Rejected keys:
```

Verify that /srv/pillar/ceph/master_minion.sls points to your administration node. In our example, it contains our salt-master FQDN: master_minion: ses55-admin.suse-sap.net.

15. Prepare the cluster:



[14/14]	ceph.updates on
	ses55-osd1.suse-sap.net
	ses55-admin.suse-sap.net ✓ (8s)
	ses55-osd0.suse-sap.net
	ses55-osd2.suse-sap.net
Ended s	<pre>tage: ceph.stage.0 succeeded=14/14 time=57.7s</pre>

16. Collect information about the nodes:

17. Adapt the file <u>/srv/pillar/ceph/proposals/policy.cfg</u> to your needs. In our example, where the only deployed service is OpenAttic, it contains the following information:

```
cluster.ceph/cluster/ses55-osd2.suse-sap.net.sls
config/stack/default/ceph/cluster.yml
config/stack/default/global.yml
profile-default/cluster/ses55-admin.suse-sap.net.sls
profile-default/cluster/ses55-osd0.suse-sap.net.sls
profile-default/cluster/ses55-osd1.suse-sap.net.sls
profile-default/cluster/ses55-osd2.suse-sap.net.sls
profile-default/stack/default/ceph/minions/ses55-admin.suse-sap.net.yml
profile-default/stack/default/ceph/minions/ses55-osd0.suse-sap.net.yml
profile-default/stack/default/ceph/minions/ses55-osd1.suse-sap.net.yml
profile-default/stack/default/ceph/minions/ses55-osd2.suse-sap.net.yml
role-admin/cluster/ses55-admin.suse-sap.net.sls
role-admin/cluster/ses55-osd0.suse-sap.net.sls
role-admin/cluster/ses55-osd1.suse-sap.net.sls
role-admin/cluster/ses55-osd2.suse-sap.net.sls
role-master/cluster/ses55-admin.suse-sap.net.sls
role-mgr/cluster/ses55-osd0.suse-sap.net.sls
role-mgr/cluster/ses55-osd1.suse-sap.net.sls
role-mgr/cluster/ses55-osd2.suse-sap.net.sls
```

```
role-mon/cluster/ses55-osd0.suse-sap.net.sls
role-mon/cluster/ses55-osd1.suse-sap.net.sls
role-mon/cluster/ses55-osd2.suse-sap.net.sls
role-openattic/cluster/ses55-admin.suse-sap.net.sls
```

18. Prepare the final state of the configuration files set:

```
# salt-run state.orch ceph.stage.2
Starting stage: ceph.stage.2
Parsing ceph.stage.2 steps... #
Parsing ceph.stage.2 steps...
```

- **19**. You can now deploy your configuration:

```
# salt-run state.orch ceph.stage.3
Starting stage: ceph.stage.3
Parsing ceph.stage.3 steps... #
Parsing ceph.stage.3 steps...
```

20. When the stage 3 has been successfully passed, check the cluster health to ensure that everything is running properly:

```
# ceph -s
cluster:
   id: <UUID>
    health: HEALTH_OK
```

```
services:
  mon: 3 daemons, quorum ses55-osd0, ses55-osd1, ses55-osd2
  mgr: ses55-osd0(active), standbys: ses55-osd1, ses55-osd2
  osd: 16 osds: 16 up, 16 in
data:
  pools: 0 pools, 0 pgs
  objects: 0 objects, 0B
  usage: 16.1GiB used, 302GiB / 318GiB avail
  pgs:
```

21. To benefit from the OpenAttic Web UI you have to initiate the **ceph.stage.4** which will install the OpenAttic service:

22. You can now manage your cluster through the Web UI:

USE Enterprise	e Storage		🛓 openattic English 👻	A Notifications Z Background-Tasi	ks 🕨 API-Recorder 🕞
shboard OSDs RB	Ds Pools Nodes	iSCSI NFS Object	Gateway 👻 CRUSH Map	o System -	
🌀 📰 Ceph - Cl	uster +			🖉 Last 12 hour	s Refresh every 30s 🛛 🕄
Interval 10s - Cluste	er ceph • Exporter Instance	ses55-admin.suse-sap.net:91	28 -		0-17 07:01:14 to 0-17 19:01:14
Health Status	Monitors In Quorum	Pools	Used Capacity	Average OSD Apply Latency	Average OSD Commit Latency
ОК	3	N/A	5.045%	5.53 ms	5.53 ms
OSDs IN	OSDs OUT	OSDs UP	OSDs DOWN	Average Pe	Gs per OSD
16	0	16	0)
Ca 326 GIB	pacity	Thro 1.0 Bps	oughput	1.0	PS
279 GiB 233 GiB		0.5 Bps		0.5	
186 GiB 140 GiB		(+) write (+) write (+)		read (-) / write (+)	
93 GIB		-0.5 Bps		-0.5	
47 GIB					

FIGURE 28: SUSE ENTERPRISE STORAGE WEB UI

23. To provide a SAP Data Hub RBD device, create a pool for it:

\rightarrow C $\hat{\mathbf{u}}$ $(\hat{\mathbf{u}})$ http://	://ses55-admin.suse-sap.net/oper	nattic/#/ ••• 💟	☆ ॥\ 🗈	:
SUSE Entérprise	Storage ^{Notifications}	⊠ Background-Tasks	API-Recorder	🕞 Logout
Dashboard OSDs RBD	os Pools Nodes	iscsi nfs	Object Gateway 🗸	
CRUSH Map System 👻				
Ceph Pools » Add				
Create Ceph pool: sap	dh26			
Name *	sapdh26			
Pool type *	Replicated pool		•	
Crush ruleset *	replicated_rule			
	Size Steps		_	
Replicated size *	3		~	
	Minimum: 1 Maximum: 10			
Placement groups	512		`	
	Calculation help			
Compression				
Mode *	none		•	
Applications				
Add applications	- Select an application to u	ise -	- +	
Applications *	rbd		匬	
			Create Back	

FIGURE 29: CEPH POOL

24. Now provide access to this pool through an RBD device.

(←) → C	۵	i) http://se	es55-admin.su	ise-sap.net/op	enattic/#/	🗵	1	III\ 🗊	٢	≡
SUSE E	Enterp	rise Ś	törage	Notifications	⊠Back	ground-Tasks	► API-Re	corder	🗈 Log	gout
Dashboard	OSDs	RBDs	Pools	Nodes	iscsi	NFS	Object Ga	iteway 🗸		
CRUSH Map	Systen	n -								
Ceph RBDs » Add										
Crea	te RBD: sa	pdh26rbd								
	Name *		sapdh26rb	d						
	Pool * Size * Object size *		sapdh26 (95.48 GiB fre	e)			-		
			0 B of 95.48 Gil	B used			95.48 GiB free -	• use max		
			50 GB							
			4 MiB							
	Features	0*	🗸 Use defaul	t features						
							Create	e Back		

FIGURE 30: CEPH RBD

25. You can now proceed to Section 4.1.2, "Prerequisites on the SUSE CaaS Platform 3 Cluster".

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