# SAP Data Intelligence 3 on CaaS Platform 4.2

## Installation Guide

SUSE CaaS Platform 4.2
SUSE Linux Enterprise Server for SAP Applications 15
SAP Data Intelligence 3

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Installation Guide

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SAP Data Intelligence 3 is the tool set to govern big amount of data. SUSE CaaS Platform 4 is the Kubernetes base that makes deploying SAP Data Intelligence 3 easy. This document describes the installation and configuration of SUSE CaaS Platform 4 and SAP Data Intelligence 3.

# Contents

# 1 Introduction

This guide describes the on-premises installation of SAP Data Intelligence 3 on SUSE CaaS Platform 4.2.

# 2 Prerequisites

## 2.1 Hardware

For **sizing** information, see in addition the SAP documentation: Sizing Guide for SAP Data Intelligence (https://help.sap.com/viewer/835f1e8d0dde4954ba0f451a9d4b5f10/3.0.latest/en-US)

At least eight nodes are needed for a Kubernetes cluster for production use.

- Minimal requirements:
  - three master nodes
  - four worker nodes
  - one or two loadbalancers (these can be virtual machines)

For the installation of SUSE CaaSP 4.2, additional hosts are needed:

- Management host
- Registry for storing container images

These can be virtual machines.

## 2.2 Software

- SUSE Linux Enterprise 15 SP1
- SUSE CaaSP 4.2

# 3 Installing SUSE CaaSP 4.2

## 3.1 Documentation

SUSE CaaS Platform 4.2 is documented here:

- SUSE CaaS Platform product documentation (https://documentation.suse.com/suse-caasp/4.2/)

## 3.2 Preparations

On all the nodes, install SUSE Linux Enterprise 15 SP1 or higher, as per the documentation for CaaS Platform 4.2.

On each respective node, the following modules or products are required.

- Management host:
  - SUSE Linux Enterprise 15 SP1
  - SUSE Linux Enterprise 15 SP1 Containers Modules
  - SUSE Linux Enterprise 15 SP1 Public Cloud
  - SUSE CaaSP 4
- Kubernetes master nodes:
  - SUSE Linux Enterprise 15 SP1
  - SUSE Linux Enterprise 15 SP1 Public Cloud
  - SUSE CaaSP 4

- Kubernetes worker nodes:
  - SUSE Linux Enterprise 15 SP1
  - SUSE Linux Enterprise 15 SP1 Public Cloud
  - SUSE CaaSP 4
- Loadbalancer host:
  - SUSE Linux Enterprise Server for SAP Applications 15 SP1
    or
  - SUSE Linux Enterprise 15 SP1 plus High Availability Extension

## 3.3 Installing the SUSE CaaSP 4 cluster nodes

- Install SUSE Linux Enterprise 15 SP1.

### Note

Use the "Expert Partitioner" to disable and remove any automatically-configured swap partitions on the Kubernetes nodes.

See the relevant product documentation:

- SUSE Linux Enterprise Server 15 SP1 Deployment Guide (https://documentation.suse.com/sles/15-SP1/single-html/SLES-deployment/#book-sle-deployment)
- SUSE CaaS Platform Deployment Guide (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/)

## 3.4 Installing the loadbalancer for the Kubernetes cluster

- Install SUSE Linux Enterprise 15 SP1
- Install `ha-proxy` or `nginx`
- Configure the loadbalancer

See the relevant product documentation:

- SUSE CaaS Platform Deployment Guide (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/)

## 3.5 Installing the management workstation

- Install SUSE Linux Enterprise 15 SP1
- Add the necessary SUSE Linux Enterprise 15 SP1 modules: value

```
$ sudo SUSEConnect -r CAASP_REGISTRATION_CODE
$ sudo SUSEConnect -p sle-module-containers/15.1/x86_64
$ sudo SUSEConnect -p caasp/4.0/x86_64 -r CAASP_REGISTRATION_CODE
$ sudo SUSEConnect -p sle-module-python2/15.1/x86_64
```

## 3.6 Bootstrapping the SUSE CaaSP 4 cluster

- Run the `skuba` tool for initialization of the cluster.
- Make sure that `ssh` is working between all nodes without using passwords, and configure `ssh-agent`.

```
$ eval `ssh-agent`
$ ssh-add <path to key>
```

```
$ skuba cluster init --control-plane <LB IP/FQDN> my-cluster
```

- Bootstrap the cluster:

```
$ cd my-cluster
$ skuba node bootstrap --target <IP/FQDN> <NODE NAME>
```

- Add additional master nodes:

```
$ cd my-cluster
$ skuba node join --role master  --target <IP/FQDN> <NODE NAME>
```

- Repeat this for all the master nodes.

- Add the worker nodes:

```
$ cd my-cluster
$ skuba node join --role worker --target <IP/FQDN> <NODE NAME>
```

- Repeat this for all worker nodes.
- Finally, check the cluster status.

```
$ cd my-cluster
$ skuba cluster status
$ cp -av  ~/my-cluster/admin.conf  ~/.kube/config
$ kubectl get nodes -o wide
```

# 4 Adding secure private Docker Registry for container images

## Tip

This step is optional if you already have a private secure Docker Registry. If you skip this chapter, follow the instructions in *Section 5, "SUSE Enterprise Storage"*.

To satisfy the requirements for SAP Data Intelligence 3, you also need a Docker Registry. The easiest way to build and manage one is using the Harbor project (https://goharbor.io/).

To this end, you need to create a dedicated server for your Docker registry and the Harbor stack.

## Warning

As Docker only allows characters within the range [a-z],[A-Z],[0-9] and '-' for domain names, make sure that your FQDN does not contain any other characters.

In our example, the server will be connected to a local bridge which provides common services (DNS, SMT, Docker-registry) for the SAP Data Intelligence stack. The FQDN of this server will be `harbor-registry.example.com`.

## 4.1 Prerequistes

Find the prerequisites for Harbor here: Harbor Installation Prerequisites (https://goharbor.io/docs/2.1.0/install-config/installation-prereqs/)

Before you can set up Harbor, you need to install Docker and Docker Compose.

- To install Docker, run:

```
# zypper in -y docker
```

- To install Docker Compose, you must download the executable from its GitHub repository (https://github.com/docker/compose) and save it into a directory within your $PATH. For example, run:

```
# curl -L "https://github.com/docker/compose/releases/download/1.25.5/docker-
compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose
```

```
# chmod +x /usr/local/bin/docker-compose

# ln -s /usr/local/bin/docker-compose /usr/bin/docker-compose
```

The next steps will generate the certificates used to make Harbor secure. These can also be found in the document Configure HTTPS Access to Harbor (https://goharbor.io/docs/2.1.0/install-config/configure-https/).

1. First, generate a CA certificate private key:

```
# openssl genrsa -out ca.key 4096
```

2. Then, generate a certificate with the given key for your domain.

### Note

For all further steps, replace <FQDN> with your fully qualified domain name. In our example, this would be `harbor-registry.example.com`.

```
# openssl req -x509 -new -nodes -sha512 -days 3650 \
  -subj "/C=DE/ST=BW/O=SUSE/CN=<FQDN>" \
  -key ca.key \
  -out ca.crt
```

Your CA certificate is now ready for use.

3. Next, you must generate a server certificate as follows:

```
# openssl genrsa -out <FQDN>.key 4096
```

4. Generate a certificate signing request (CSR):

```
# openssl req -sha512 -new \
  -subj "/C=DE/ST=BW/O=SUSE/CN=<FQDN>" \
  -key <FQDN>.key \
  -out <FQDN>.csr
```

5. Create an `x509 v3` extension file with the following content:

```
authorityKeyIdentifier=keyid,issuer
basicConstraints=CA:FALSE
keyUsage = digitalSignature, nonRepudiation, keyEncipherment, dataEncipherment
```

```
extendedKeyUsage = serverAuth
subjectAltName = @alt_names

[alt_names]
DNS.1=<FQDN>
DNS.2=<hostname>
```

6. Use the extension file to generate a certificate:

```
# openssl x509 -req -sha512 -days 3650 \
  -extfile v3.ext \
  -CA ca.crt -CAkey ca.key -CAcreateserial \
  -in $fqdn.csr \
  -out $fqdn.crt
```

7. Copy the `.crt` and `.key` files to the system's certificate directory:

```
# cp <FQDN>.crt /etc/pki/trust/anchors/
# cp <FQDN>.key /etc/pki/trust/anchors/
```

8. As Docker interprets `.crt` files as CA certificates and `.cert` files as clients, you must convert your `.crt` file as follows:

```
# openssl x509 -inform PEM -in <FQDN>.crt -out $<FQDN>.cert
```

9. You can now copy the newly created certificates to your Docker certificate directory. If the directory `/etc/docker/certs.d` does not exist, create it.

```
# mkdir /etc/docker/certs.d/<FQDN>
# cp <FQDN>.cert /etc/docker/certs.d/<FQDN>/
# cp <FQDN>.key /etc/docker/certs.d/<FQDN>/
# cp ca.crt /etc/docker/certs.d/<FQDN>/
```

### Note

If you want to expose your registry on a port other than 443, you must create a directory `/etc/docker/certs.d/<FQDN>:<Port>` and copy the certificates to this directory instead.

10. To introduce the certificates to Docker, restart the Docker daemon:

```
# systemctl restart docker
```

## 4.2 Setting up Harbor

1. Fetch the Harbor installer and extract its contents:

```
# wget https://github.com/goharbor/harbor/releases/download/v2.1.1/harbor-online-
installer-v2.1.1.tgz
# tar xvf harbor-online-installer-v2.1.1.tgz
```

2. Enter the extracted directory:

```
# cd harbor
```

3. Within this directory, you should find a file called `harbor.yml.tmpl`. It contains the configuration for the Harbor Registry and must be adjusted.

   a. First, edit the `hostname` field and enter your FQDN.

   b. Next, update the **HTTPS** configuration. The subentries `certificate` and `private_key` must be adjusted so they point to the `.crt` and `.key` files you created in *Section 4.1, "Prerequistes"*.

This should look like the following:

If you want to expose registry on a port other than 443, you can change the `port` sub-entry to match your desired port.

c. You should also change the `administrator` password for Harbor, which by default is defined in the field `harbor_admin_password: Harbor12345`.

d. The last field to mention is `data_volume: /data`, which defines where all Harbor data will be stored. If you want Harbor to store the data somewhere else, enter the path to the desired directory here.

4. When done, save your changes, and rename the file by removing the `.tmpl` suffix:

```
# mv harbor.yml.tmpl harbor.yml
```

5. As Harbor uses `nginx` as a reverse proxy for all services, you must run the `prepare` script to configure it correctly:

```
# ./prepare
```

6. You can now start the needed containers using Docker Compose:

```
# docker-compose up -d
```

Harbor should now be up and running.

7. Distribute the CA certificate to all Kubernetes nodes, so they can access the registry. Run the following commands on all the nodes:

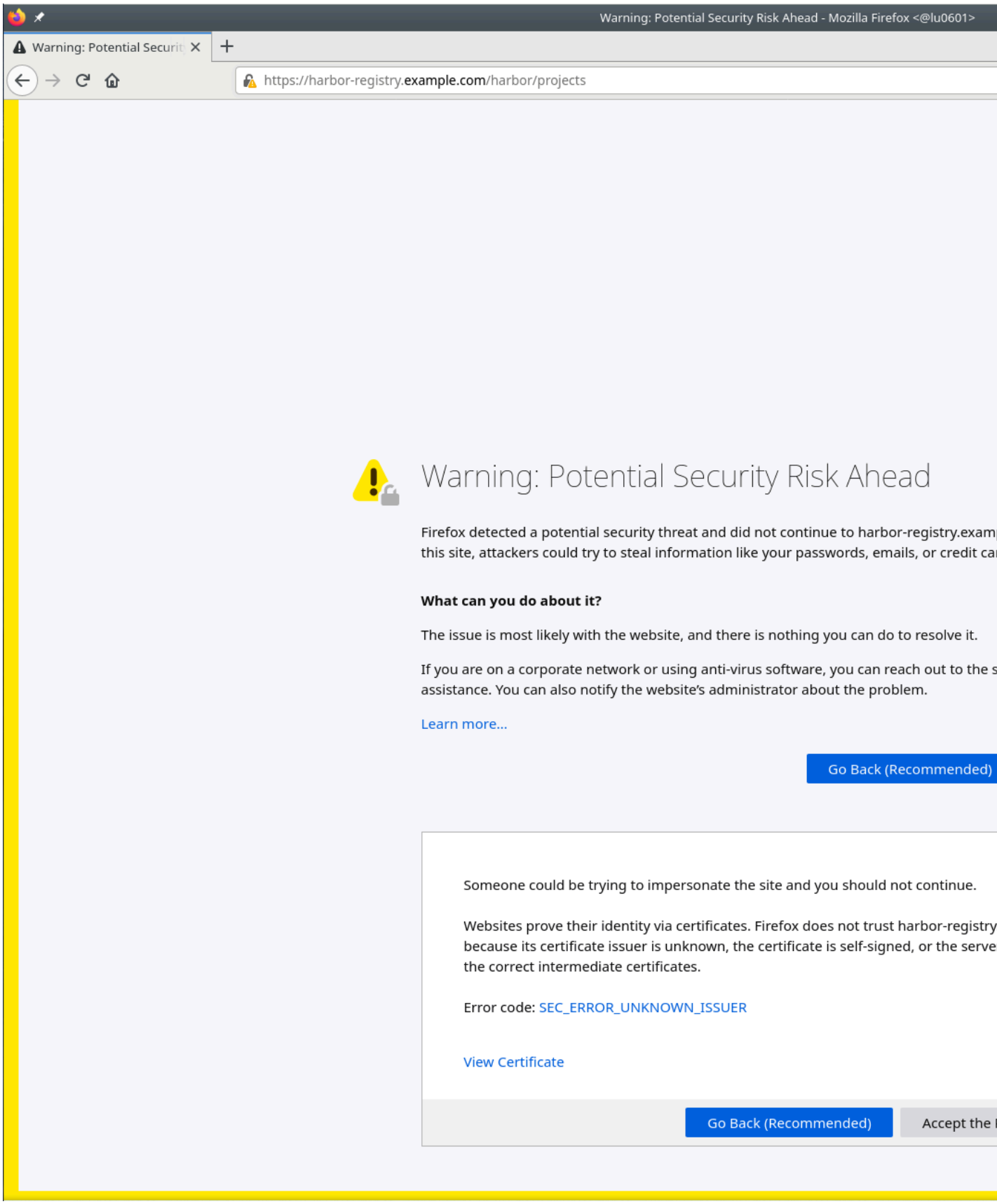
```
# scp <FQDN>:/etc/docker/certs.d/<FQDN>/ca.crt /etc/docker/certs.d/<FQDN>/<FQDN>.crt
# systemctl restart docker
```

For the example <FQDN> of `harbor-registry.example.com`, this looks like the following:

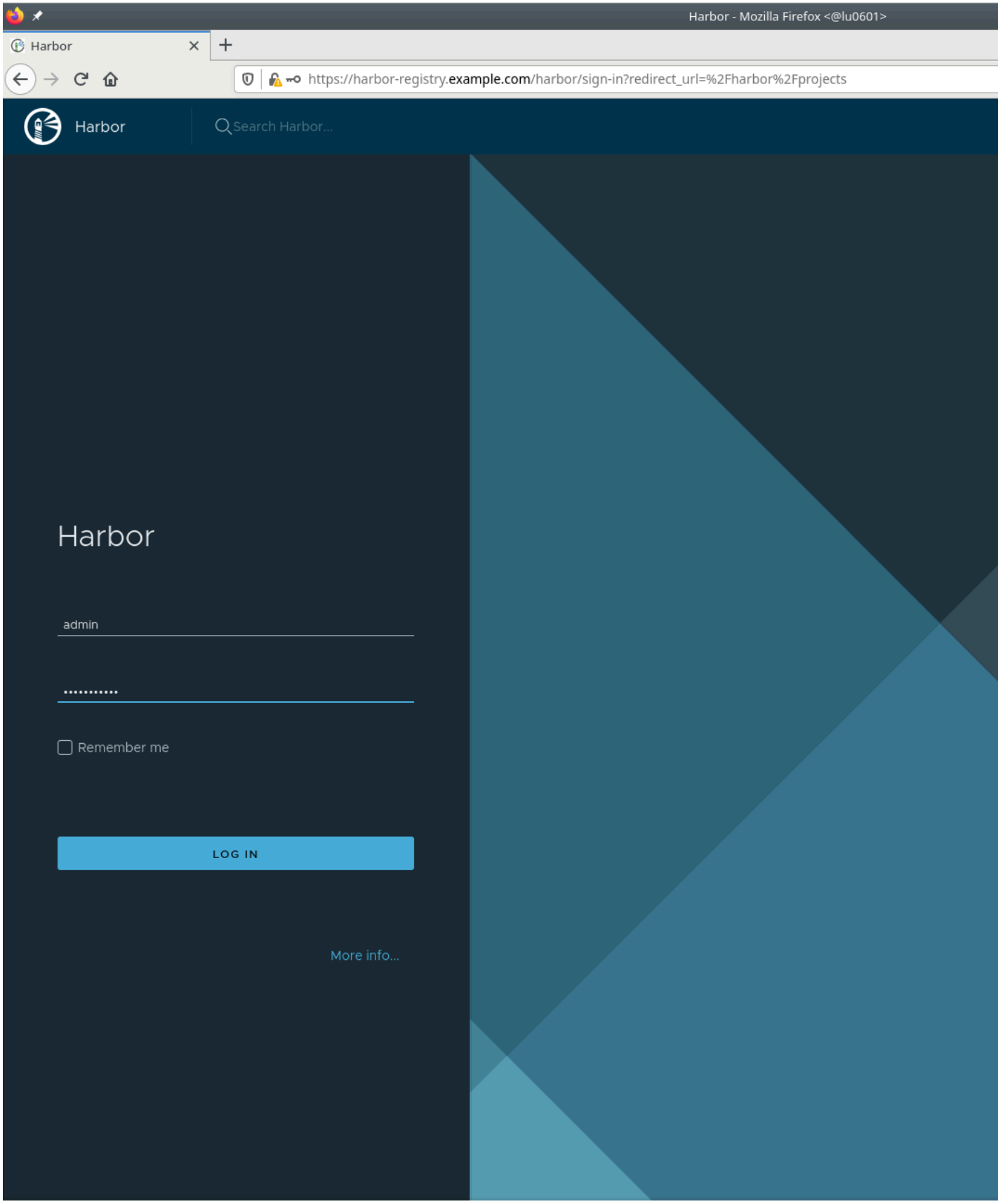
```
# scp harbor-registry.example.com:/etc/docker/certs.d/harbor-registry.example.com/
ca.crt /etc/docker/certs.d/harbor-registry.example.com/harbor-
registry.example.com.crt
# systemctl restart docker
```

## 4.3 Verifying configuration and setting up Harbor projects

To verify Harbor is running, you may access its Web front-end by visiting https://<FQDN> from your browser.

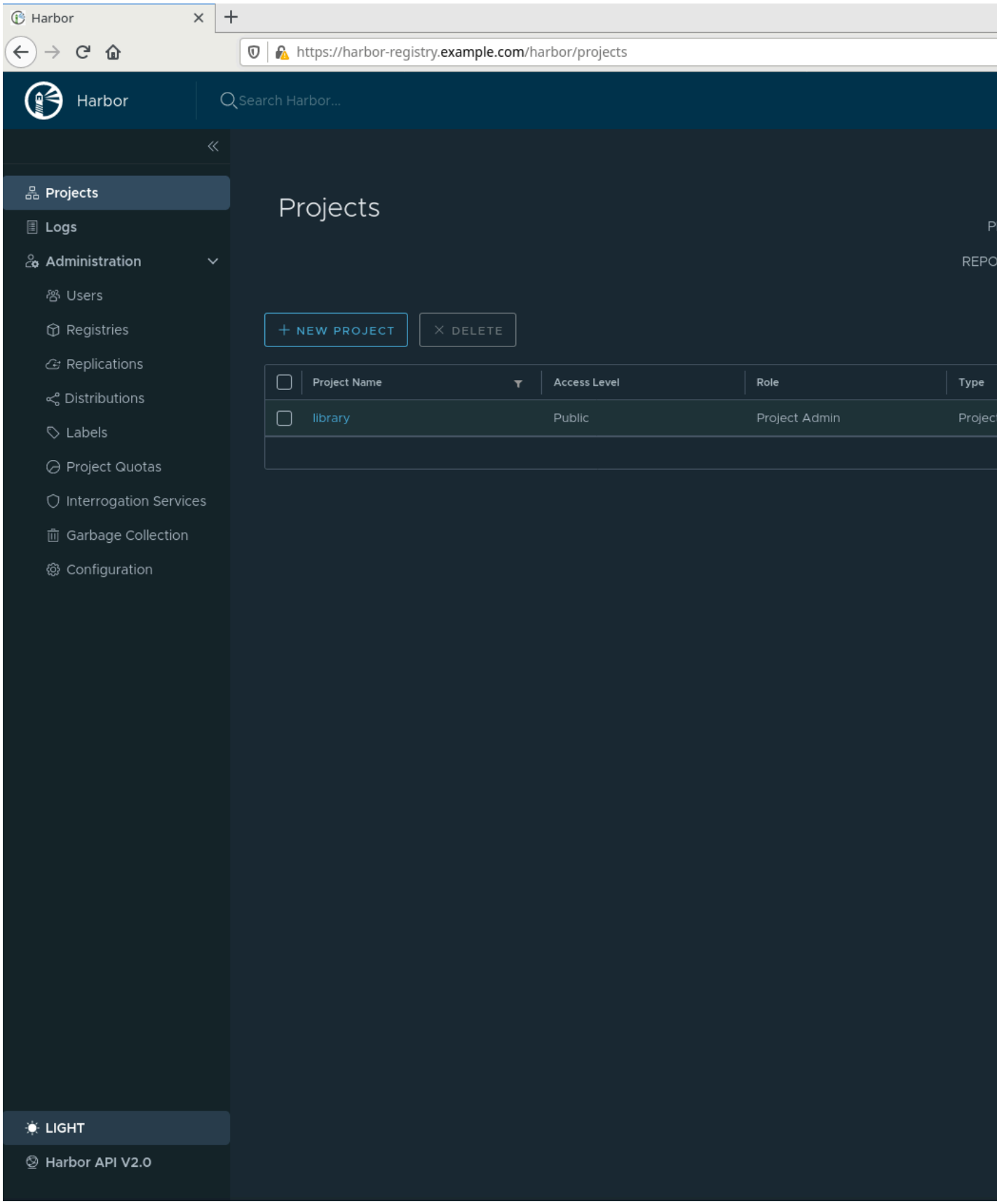

Warning: Potential Security Risk Ahead - Mozilla Firefox <@lu0601>
Warning: Potential Securit
https://harbor-registry.example.com/harbor/projects
Warning: Potential Security Risk Ahead
Firefox detected a potential security threat and did not continue to harbor-registry.exam
this site, attackers could try to steal information like your passwords, emails, or credit ca
What can you do about it?
The issue is most likely with the website, and there is nothing you can do to resolve it.
If you are on a corporate network or using anti-virus software, you can reach out to the s
assistance. You can also notify the website's administrator about the problem.
Learn more...
Go Back (Recommended)
Someone could be trying to impersonate the site and you should not continue.
Websites prove their identity via certificates. Firefox does not trust harbor-registry
because its certificate issuer is unknown, the certificate is self-signed, or the serve
the correct intermediate certificates.
Error code: SEC_ERROR_UNKNOWN_ISSUER
View Certificate
Go Back (Recommended)
Accept the

You can toggle the lower box by clicking `Advanced…` Then click `Accept the Risk and Continue`. You will be redirected to the login page of your Harbor registry.


Harbor - Mozilla Firefox <@lu0601>
Harbor
https://harbor-registry.example.com/harbor/sign-in?redirect_url=%2Fharbor%2Fprojects
Harbor
Search Harbor...
Harbor
admin
Remember me
LOG IN
More info...

Enter `admin` as the user name and enter the password specified in the `harbor.yml` file. By default, this is "Harbor12345".

By default, you will be redirected to the project page which holds the "libraries" project.


Harbor
https://harbor-registry.example.com/harbor/projects
Harbor
Search Harbor...
Projects
Logs
Administration
Users
Registries
Replications
Distributions
Labels
Project Quotas
Interrogation Services
Garbage Collection
Configuration
LIGHT
Harbor API V2.0
Projects
+ NEW PROJECT
DELETE
Project Name
Access Level
Role
Type
library
Public
Project Admin

You should also check if the Docker clients on your Kubernetes nodes can access the registry. To do so, run:

```
# docker login <FQDN>
```

You will be prompted to enter a user name and password. Use `admin` for the user name, and the password you set in `harbor.yml` (default: "Harbor12345").

If Docker can access the registry, you will see a message displayed that states "Login Succeeded" or similar.

If your machines cannot resolve the FQDN of your registry, edit your `/etc/hosts` file and add a line with the following information:

```
<IP>  <FQDN>  <Hostname>
```

In our example, this will look as follows:

```
192.168.180.100  harbor-registry.example.com  harbor-registry
```

Create the namespaces on your registry that are needed for SAP Data Intelligence 3:

- `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`

# 5 SUSE Enterprise Storage

## Tip

This step is optional if you already have a storage that provides RBD volumes and/or S3 buckets. If you skip this chapter, follow the instructions in *Section 6.4, "Installing SAP Data Intelligence 3"*.

An on-premises installation of SAP Data Intelligence 3 requires SUSE Enterprise Storage 5.5 or higher.

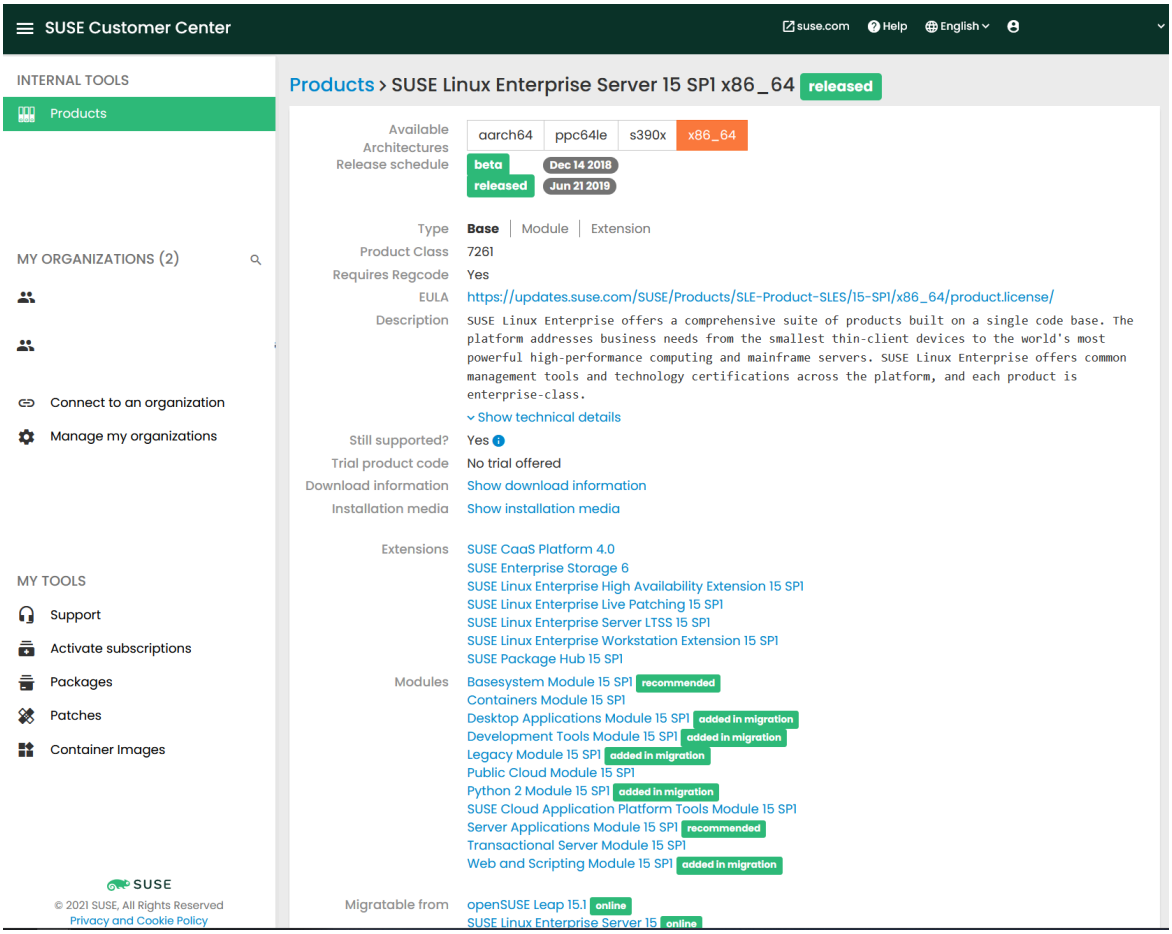
If you plan to use SUSE Enterprise Storage not only for your Kubernetes dynamic storage class but also for your Kubernetes control plane (virtualized or not), you should reserve enough resources to address the `etcd` requirements specified in the `etcd` Hardware recommendations (https://etcd.io/docs/current/op-guide/hardware/)

The following steps will deploy a minimalist, virtualized, test-oriented instance of SUSE Enterprise Storage 6. In our example, we will build a four-nodes (1 Admin + 3 OSD) Ceph cluster.

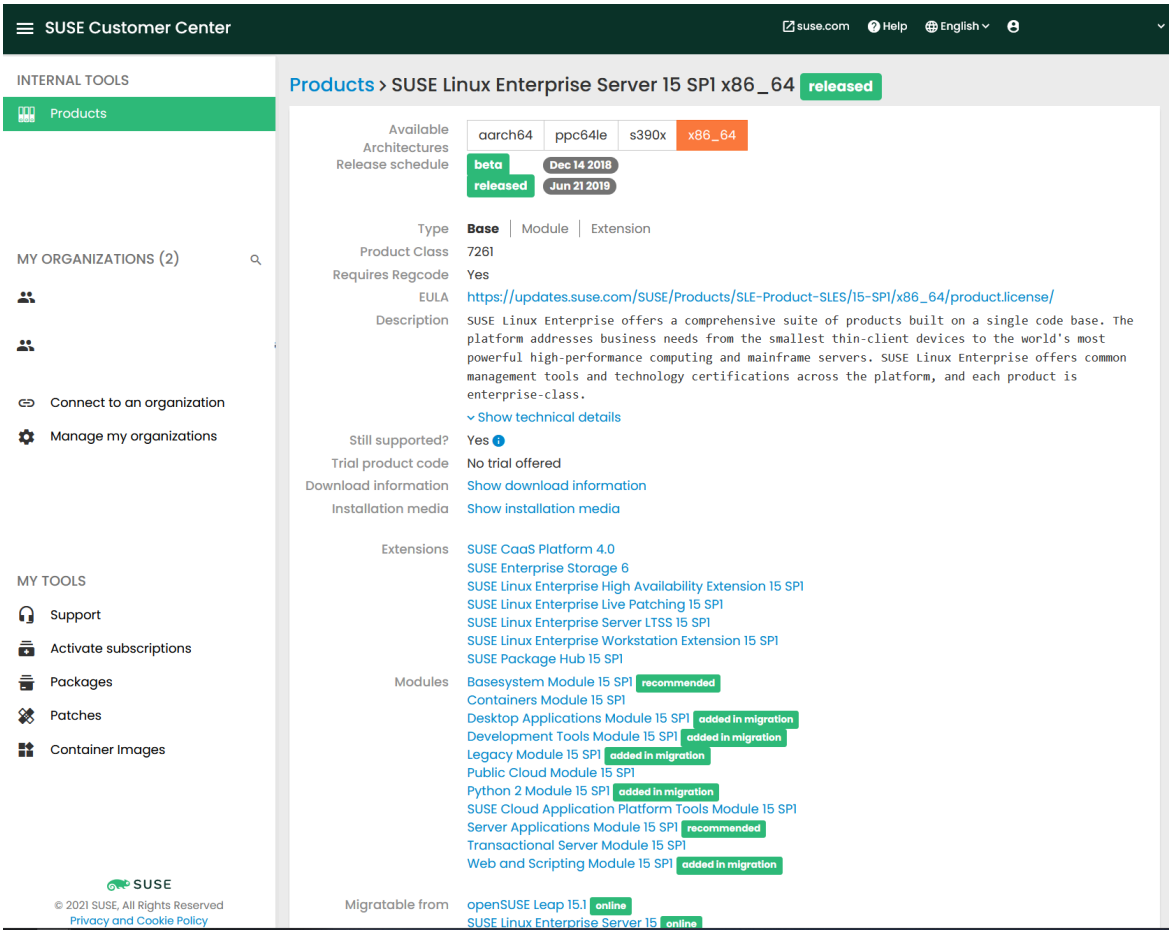
## 5.1 Before starting

- Obtain registration codes for SUSE Linux Enterprise Server 15 SP1 and SUSE Enterprise Storage from https://scc.suse.com, or have SMT/RMT properly set up and already mirroring these products.

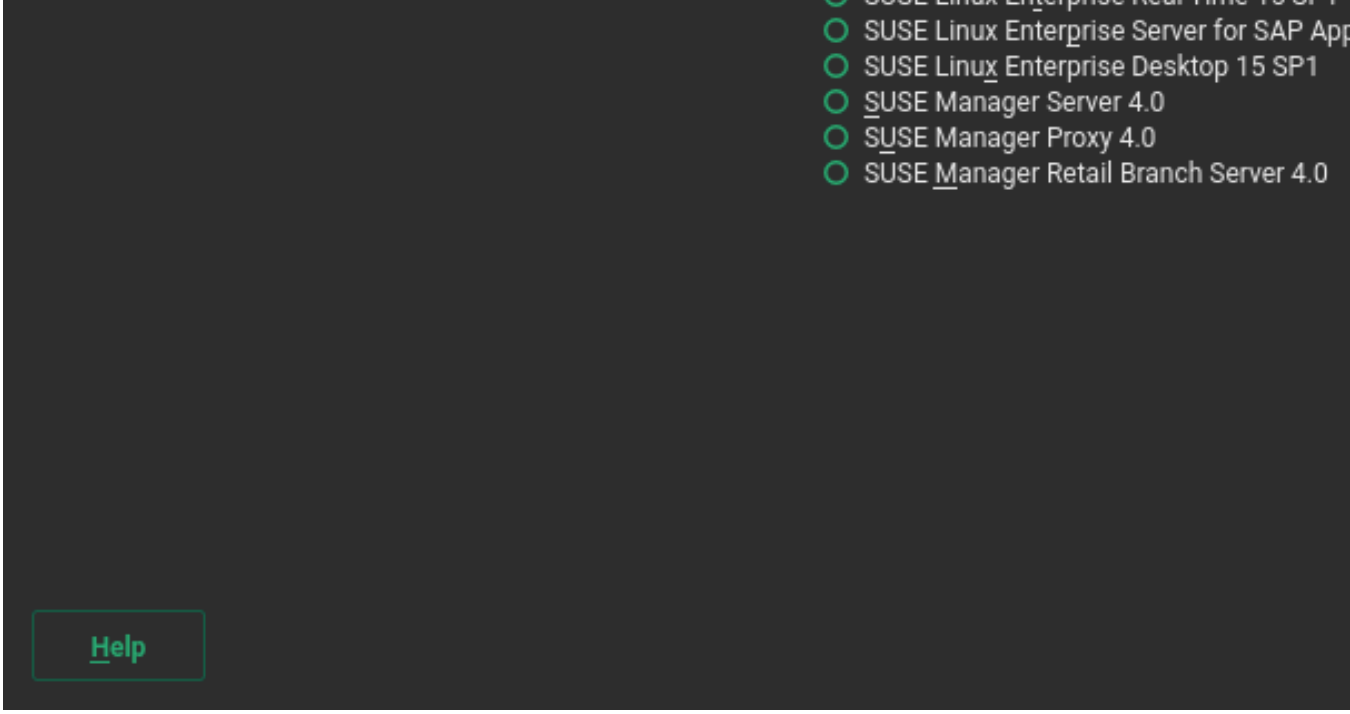
- SCC (https://scc.suse.com)



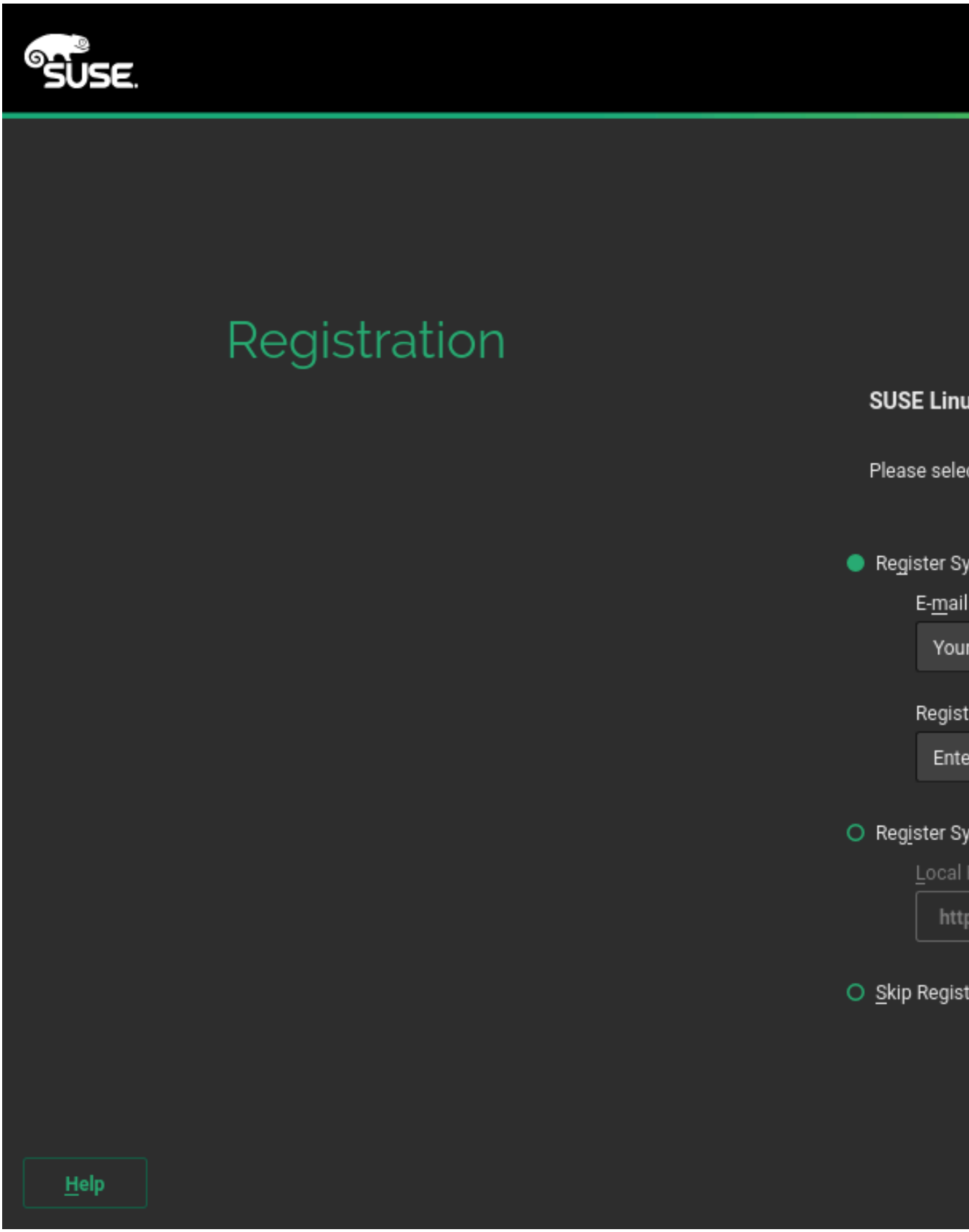
- SMT (https://documentation.suse.com/smt/11.3/html/SLE-smt/index.html)



5.2

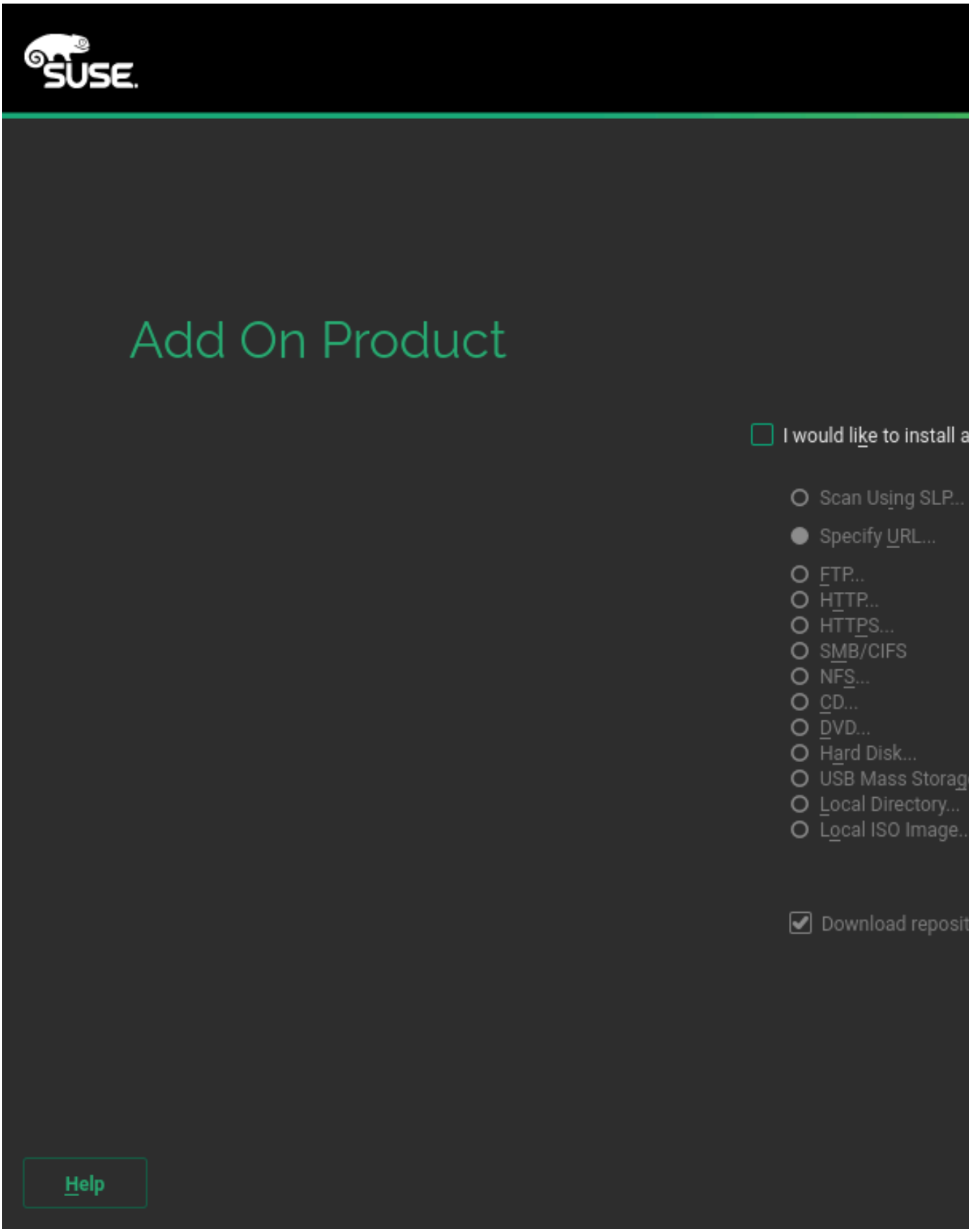

SUSE Linux Enterprise Server for SAP App
SUSE Linux Enterprise Desktop 15 SP1
SUSE Manager Server 4.0
SUSE Manager Proxy 4.0
SUSE Manager Retail Branch Server 4.0
Help

3. Select your preferred language and keyboard layout. Then select the option "SUSE Linux Enterprise Server 15 SP1" and click the "Next" button.
4. You need to agree to the license agreement. Click "Next" again.
5. The registration screen should be displayed.


Registration
SUSE Linu
Please sele
Register Sy
E-mail
Your
Regist
Ente
Register Sy
Local
http
Skip Regist
Help

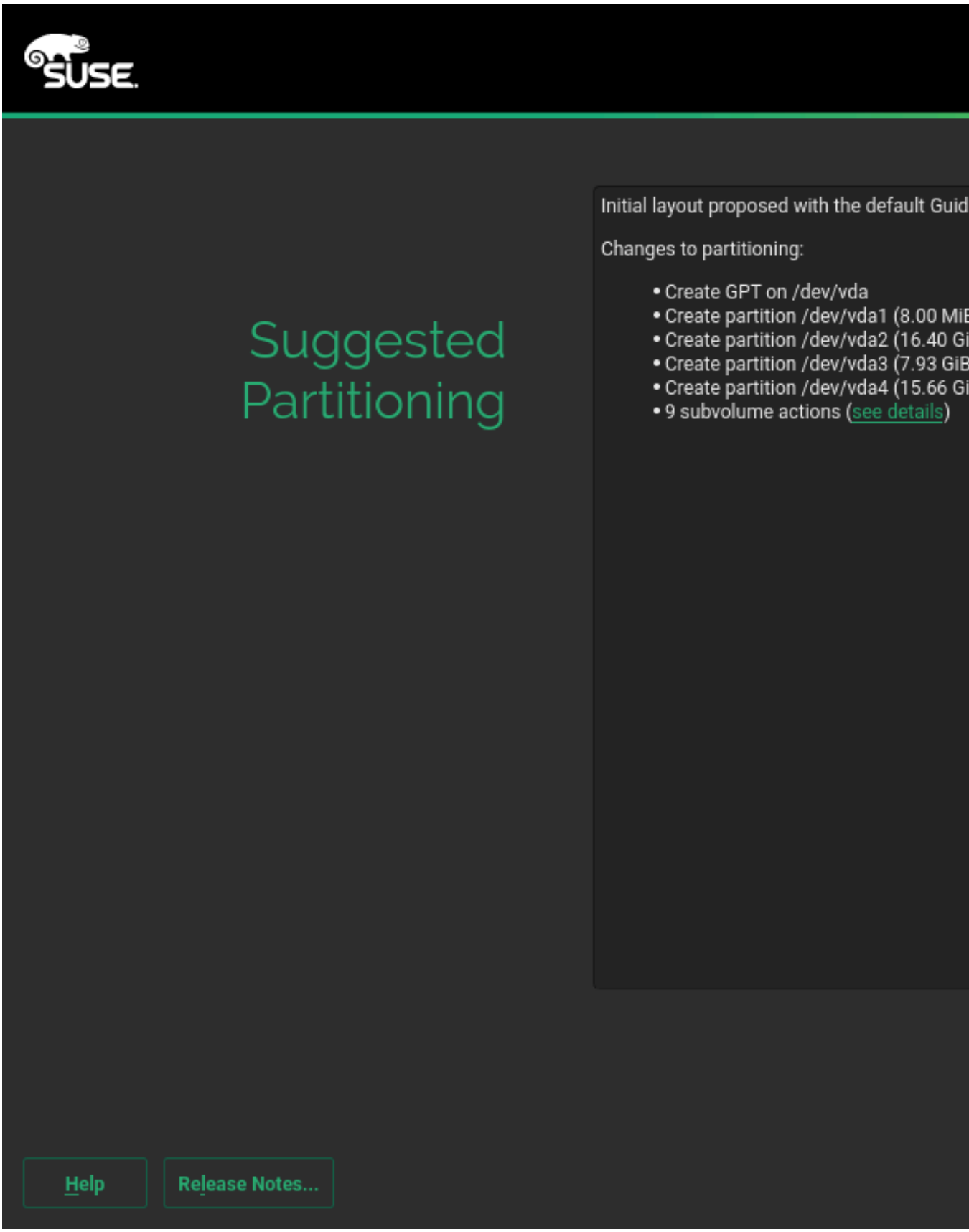
6. Now, either enter your e-mail and the registration code you collected from the SCC as described in the previous chapter, or select "Register System via local SMT Server" and enter the URL of your SMT server.

7. If required, you can use the **Network Configuration** button at the top right to configure your network settings.


Add On Product
I would like to install a
Scan Using SLP...
Specify URL...
FTP...
HTTP...
HTTPS...
SMB/CIFS
NFS...
CD...
DVD...
Hard Disk...
USB Mass Storag
Local Directory...
Local ISO Image...
Download reposit
Help

8. When the system is registered, you will see the "Add On Product" page. You can skip it by clicking the "Next" button again.

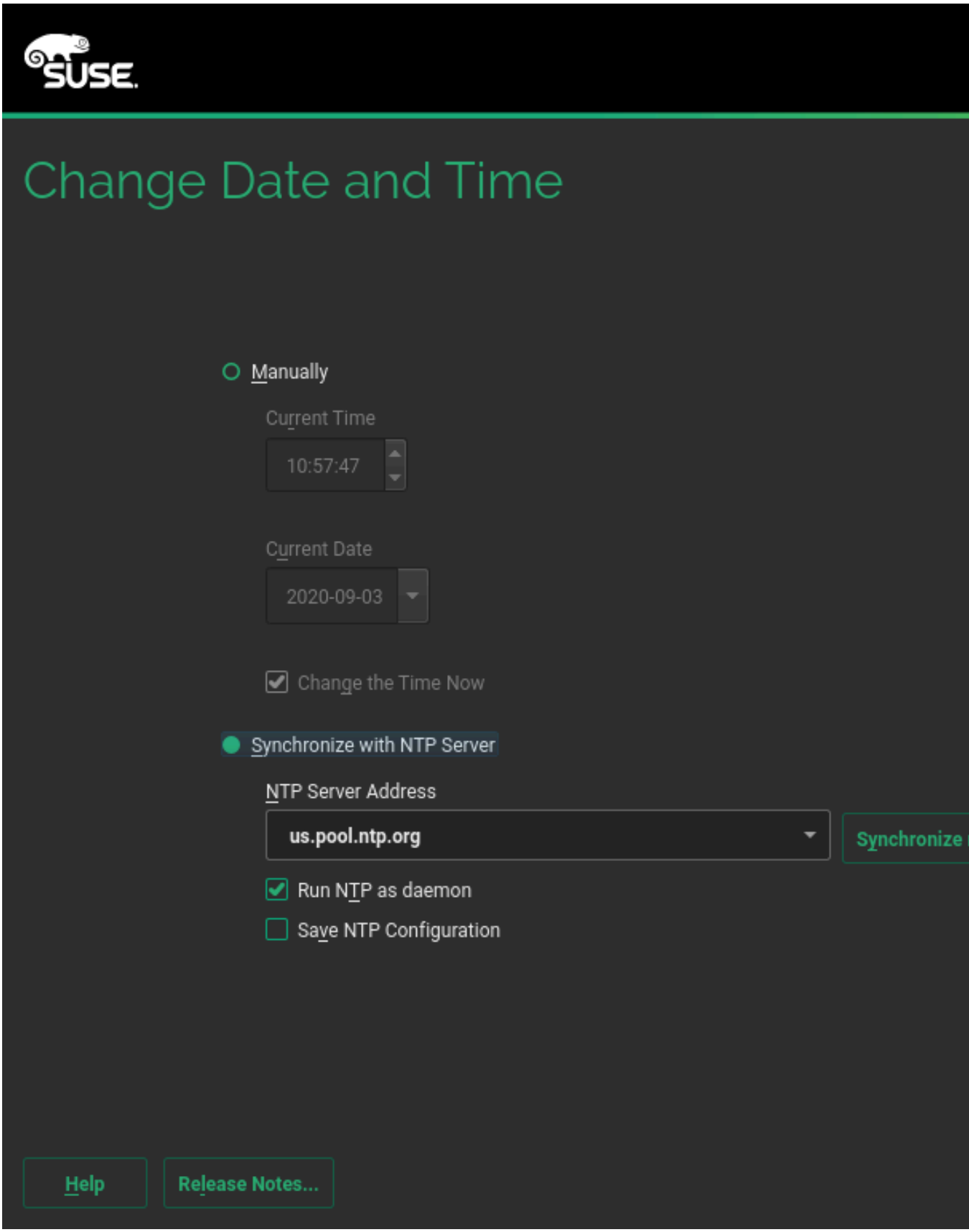
9. The "Suggested Partitioning" page will be displayed. You may edit the proposed partitioning if needed. For our example, we accept the proposal and continue by clicking the "Next" button.


Suggested Partitioning
Initial layout proposed with the default Guid
Changes to partitioning:
• Create GPT on /dev/vda
• Create partition /dev/vda1 (8.00 MiB
• Create partition /dev/vda2 (16.40 Gi
• Create partition /dev/vda3 (7.93 GiB
• Create partition /dev/vda4 (15.66 Gi
• 9 subvolume actions (see details)
Help
Release Notes...

10. On the "Clock and Time Zone" page, you should select your preferred Region and Time Zone.


Clock and Time Zone
Eastern (New York)
Region
USA
Time Zone
Eastern (New York)
Hardware Clock Set to UTC
Date and Time:
Help
Release Notes...

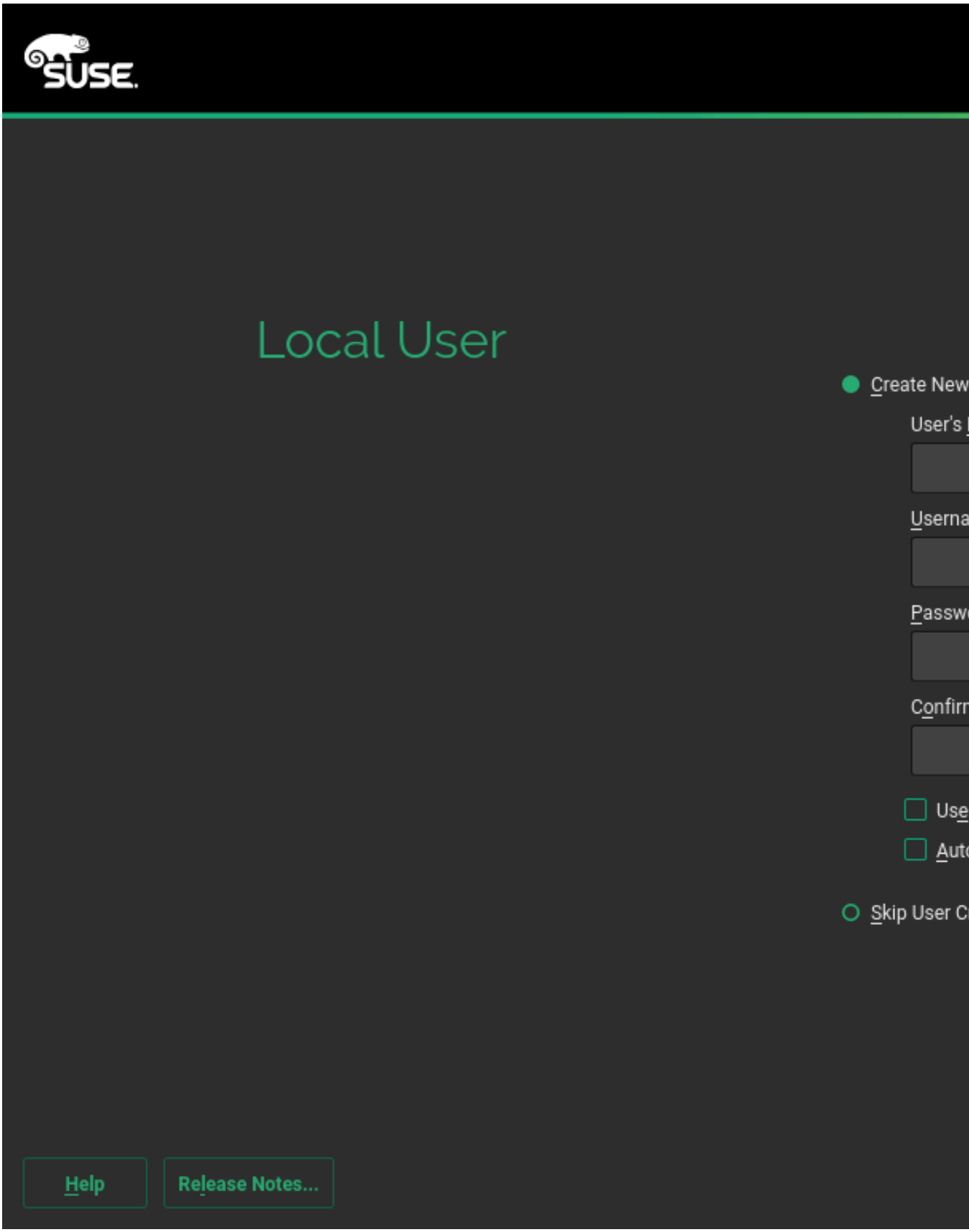
Click "Other Settings" to open the "Change Date and Time" page. Select the "Synchronize with NTP-Server" option. Then select an NTP server and click the "Accept" button.


Change Date and Time
Manually
Current Time
10:57:47
Current Date
2020-09-03
Change the Time Now
Synchronize with NTP Server
NTP Server Address
us.pool.ntp.org
Synchronize
Run NTP as daemon
Save NTP Configuration
Help
Release Notes...

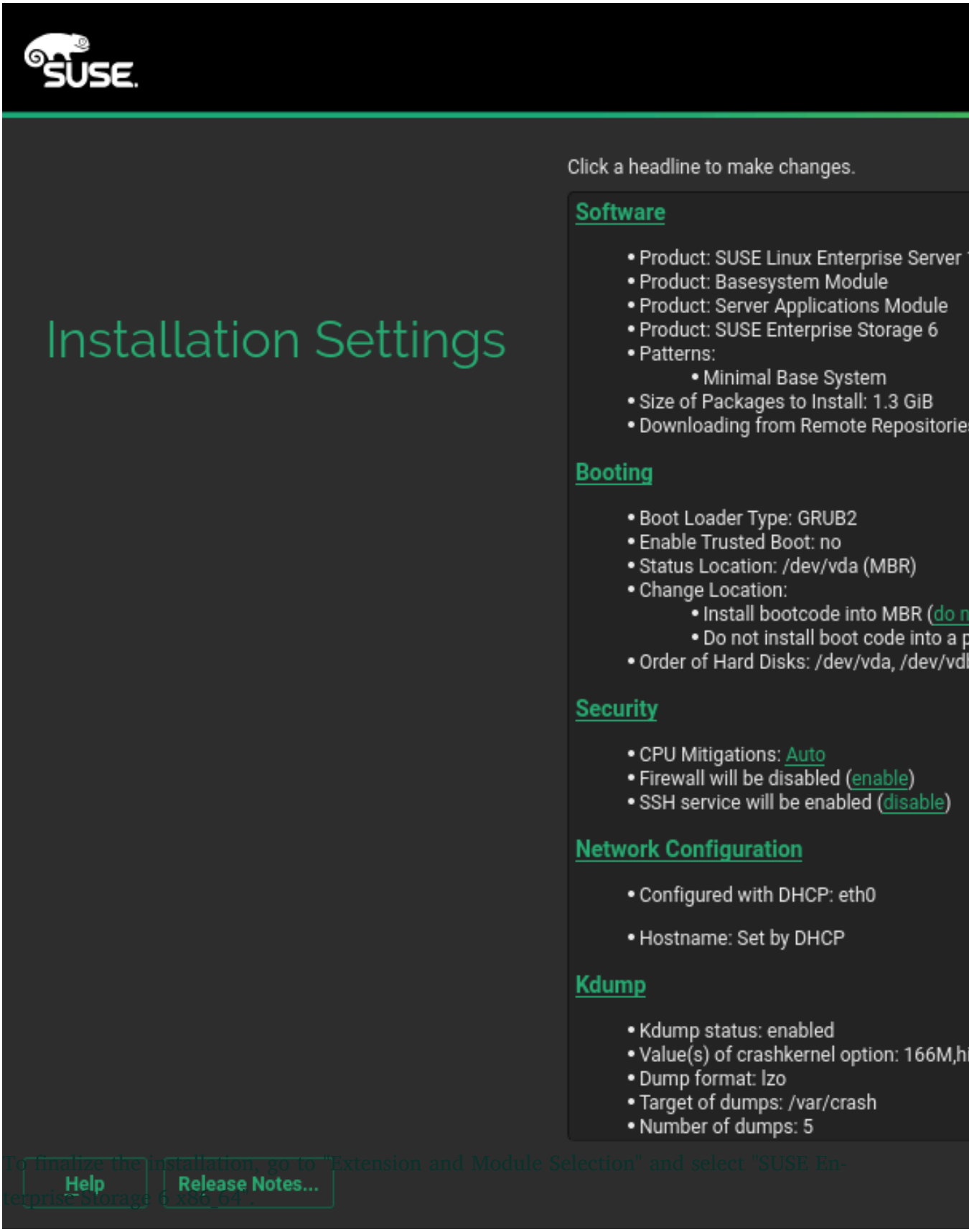
### Important

All machines in the cluster must synchronize with the same NTP Server!

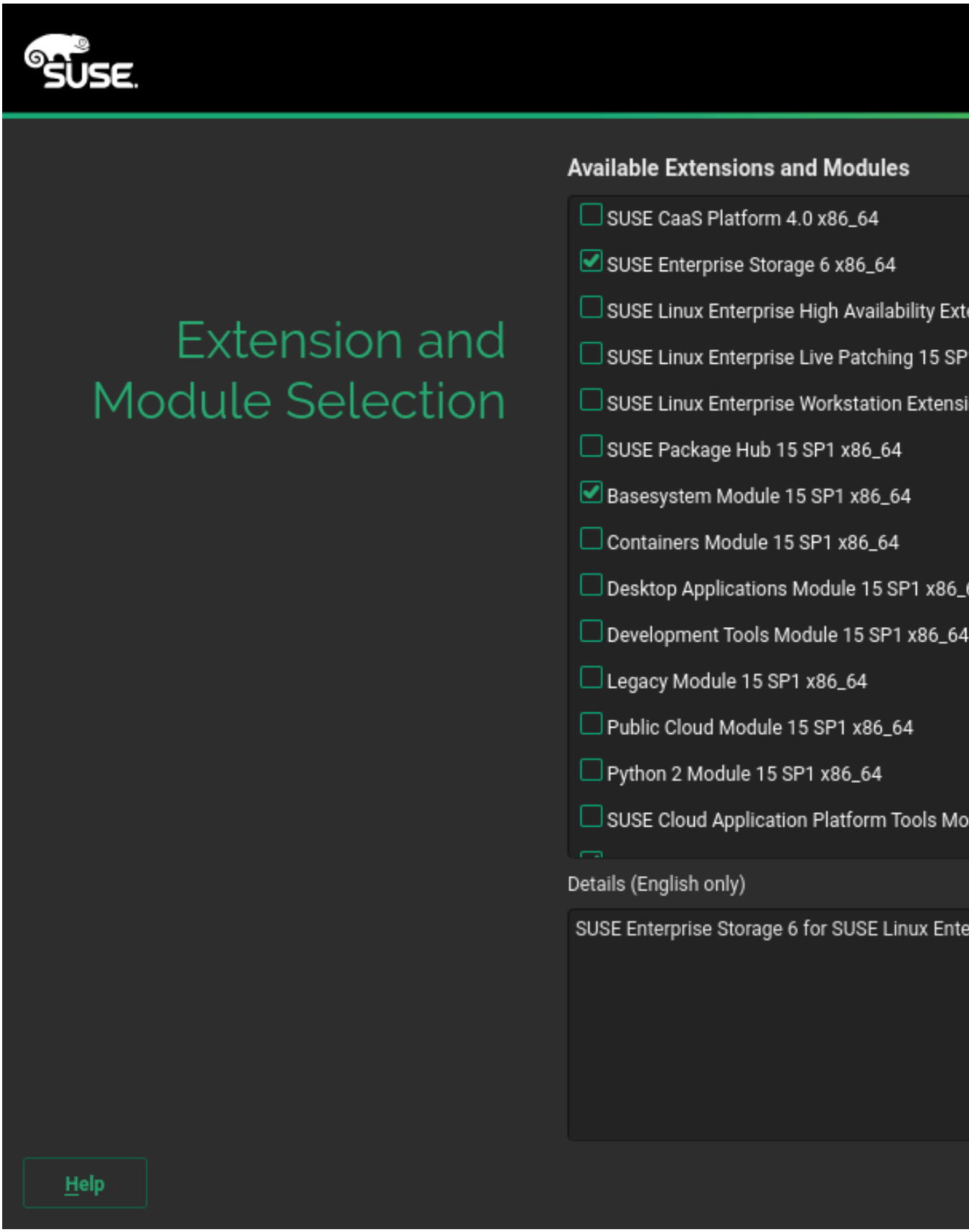
11. Next, you can create a user with name and password of your choice. When done, confirm and click "Next".


Local User
Create New
User's
Userna
Passw
Confirm
Use
Auto
Skip User C
Help
Release Notes...

12. Now the "Installation Settings" page is displayed. Disable the firewall. To do so, click the "disable" button located behind "Firewall will be enabled".




13. To finalize the installation, go to "Extension and Module Selection" and select "SUSE Enterprise Storage 6 x86_64".


Extension and Module Selection
Available Extensions and Modules
SUSE CaaS Platform 4.0 x86_64
SUSE Enterprise Storage 6 x86_64
SUSE Linux Enterprise High Availability Ext
SUSE Linux Enterprise Live Patching 15 SP
SUSE Linux Enterprise Workstation Extensi
SUSE Package Hub 15 SP1 x86_64
Basesystem Module 15 SP1 x86_64
Containers Module 15 SP1 x86_64
Desktop Applications Module 15 SP1 x86_
Development Tools Module 15 SP1 x86_64
Legacy Module 15 SP1 x86_64
Public Cloud Module 15 SP1 x86_64
Python 2 Module 15 SP1 x86_64
SUSE Cloud Application Platform Tools Mo
Details (English only)
SUSE Enterprise Storage 6 for SUSE Linux Ente
Help

Set up at least four machines the same way.

## 5.3 Setting up SUSE Enterprise Storage

Check that your machines have the correct host names:

```
# hostname -f
```

This should output the FQDN of the machine. If this is not the case, you can use the following command to set the name:

```
# hostnamectl --set-hostname <FQDN>
```

For the document at hand, we use the following machine names:

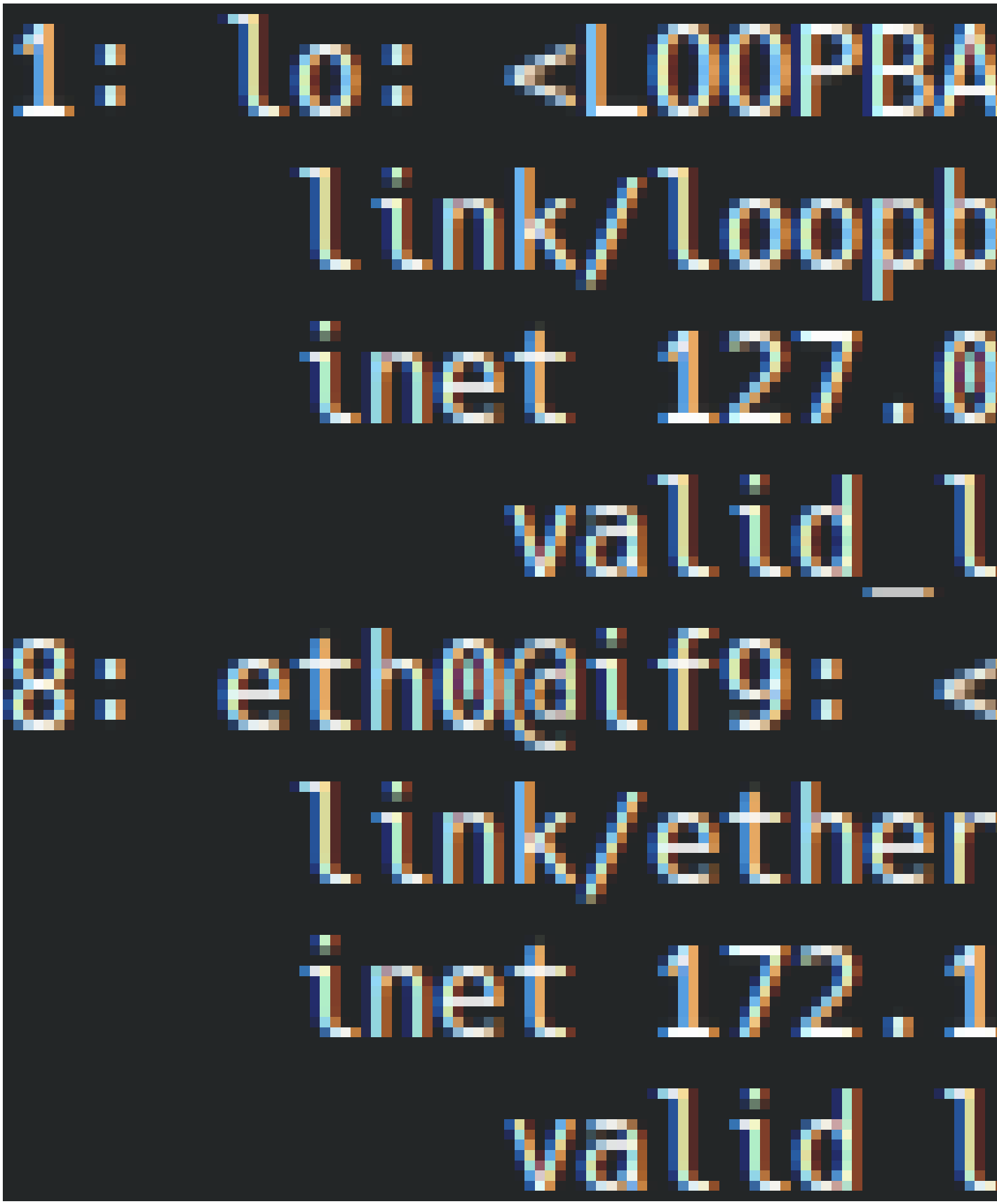
- `admin.example.com`
- `mon1.example.com`
- `mon2.example.com`
- `mon3.example.com`

To ensure that DNS resolution for these names works properly, you should edit the `/etc/hosts` file on the nodes as follows:

```
127.0.0.1   localhost
<Admin-IP>  admin.example.com admin
<Mon1-IP>   mon1.example.com  mon1
<Mon2-IP>   mon2.example.com  mon2
<Mon3-IP>   mon3.example.com  mon3
```

If you do not know the IP address of a machine, run:

```
$ ip a
```


1: lo: <LOOPBA
link/loopb
inet 127.0
valid_l
8: eth0@if9: <
link/ether
inet 172.1
valid l

### 5.3.1 Preparing the nodes

1. On the OSD Nodes, install `salt-minion` and `deepsea`:

```
# zypper in -y salt-minion deepsea
```

2. On the Admin Node, install `salt-minion`, `salt-master`, and `deepsea`:

```
# zypper in -y salt-minion salt-master deepsea
```

3. Set the Salt master on all machines by editing the associated line:

```
# echo "master: admin.example.com" > /etc/salt/minion
```

4. On the Admin node, enable the `salt-master` service:

```
# systemctl enable salt-master --now
```

5. Enable the `salt-minion` service on all nodes:

```
# systemctl enable salt-minion --now
```

6. Now accept the Salt keys on the admin node:

```
# salt-key --accept-all -y
```

**Tip**

To check the keys, use the command `salt-key -L`. This should output something like:

```
Admin:~ # salt-key -L
Accepted Keys:
admin.example.com
mon1.example.com
mon2.example.com
mon3.example.com
Denied Keys:
Unaccepted Keys:
Rejected Keys:
```

7. Make all nodes DeepSea minions:

```
# echo "deepsea_minions: '*'" > /srv/pillar/ceph/deepsea_minions.sls
```

8. Synchronize your Salt minions:

```
# salt '*' saltutil.sync_all
```

9. Make sure your desired disks are all cleared. To this end, you can use:

```
# wipefs -a /dev/vdb
```

### Note

Be aware that you might need to change the device (`vdb`) here. Ensure you clear all disks on all nodes.

10. Apply the cleared disks by using:

```
# salt '*' state.apply ceph.subvolume
```

### 5.3.2 Deploying the cluster

### Tip

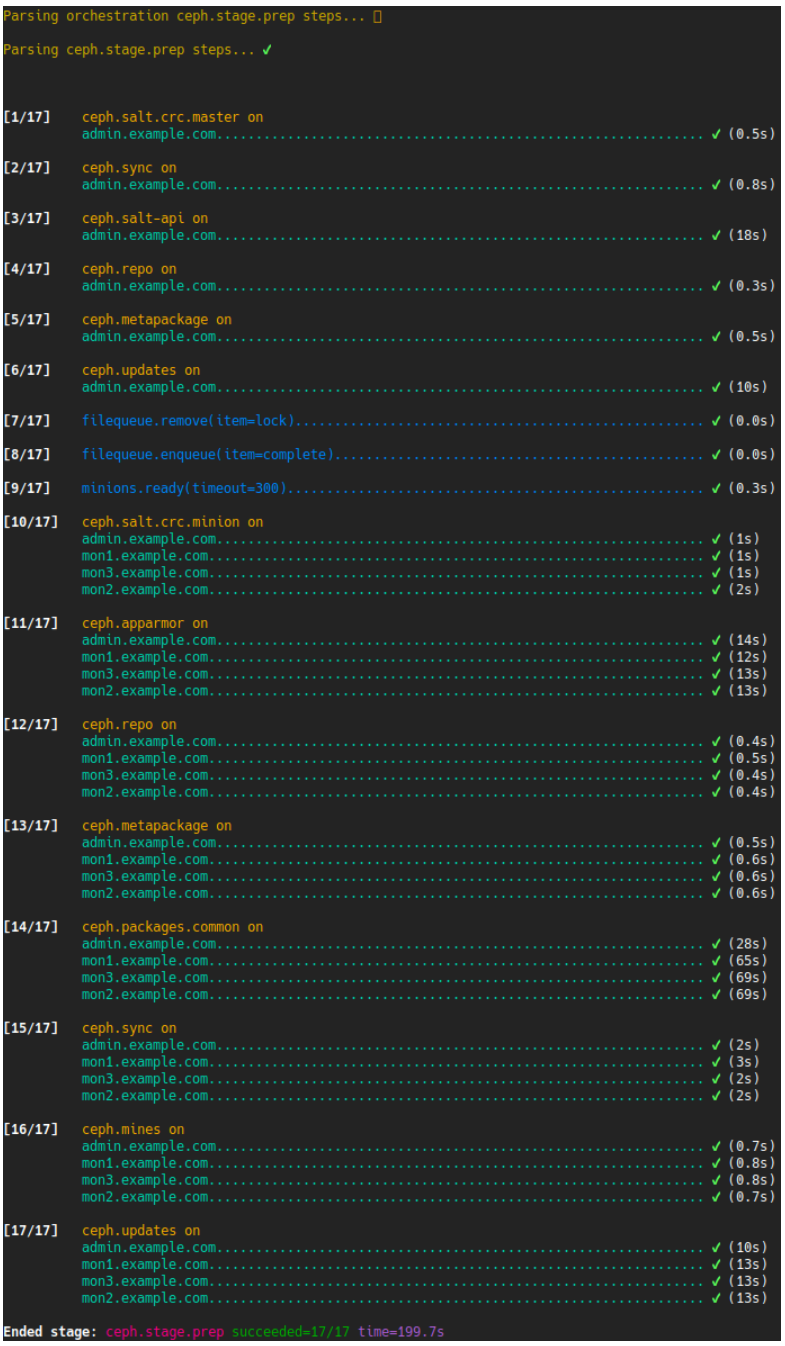
You can watch the progress of the Ceph stages in a separate terminal with the command `deepsea monitor`.

Now you can run the first stage of deploying the Ceph cluster.

1. First, prepare the cluster:

```
# salt-run state.orch ceph.stage.prep
```

2. The result for the preparation stage should look similar to this:



3. The next stage is collecting information about the nodes:

```
# salt-run state.orch ceph.stage.discovery
```

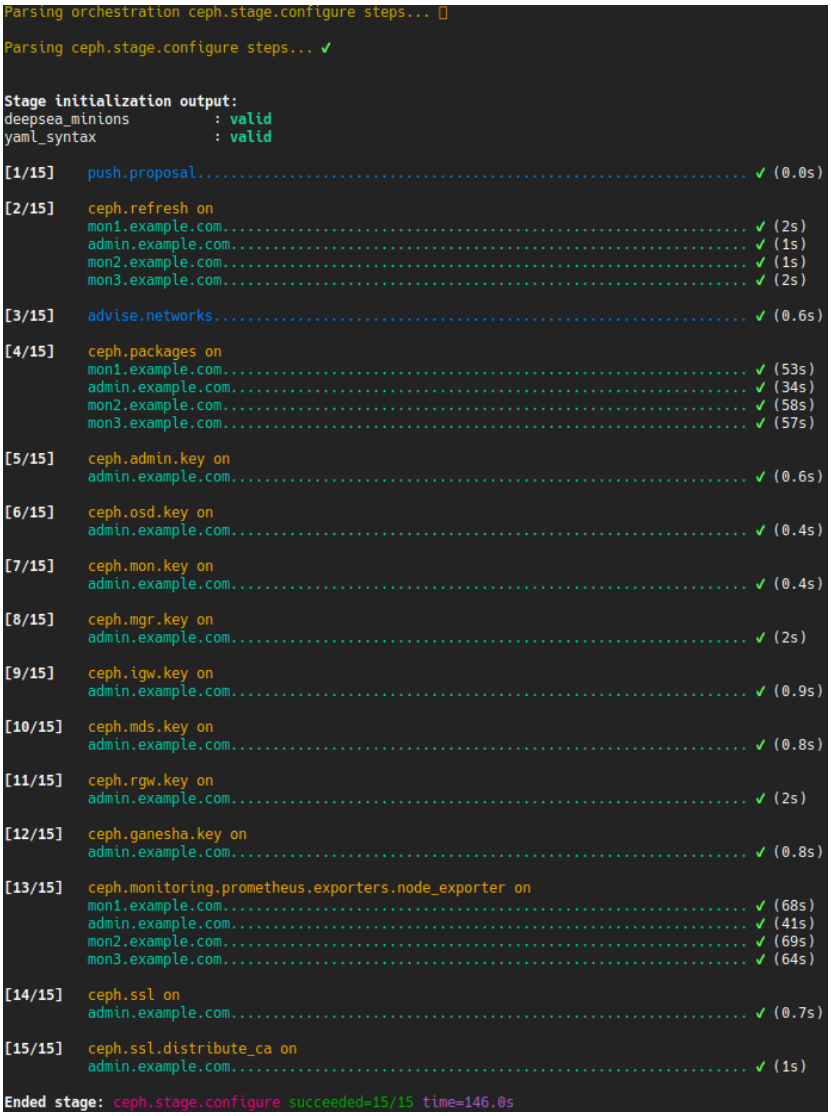

4. Before you can run the last three stages, you must provide a role configuration for the nodes. This will be stored in `/srv/pillar/ceph/proposals/policy.cfg`. This example uses the following configuration:

```
#General config
config/stack/default/global.yml
config/stack/default/ceph/cluster.yml

#CEPH Cluster members
cluster-ceph/cluster/admin.example.com.sls
cluster-ceph/cluster/mon1.example.com.sls
cluster-ceph/cluster/mon2.example.com.sls
cluster-ceph/cluster/mon3.example.com.sls

#CEPH Admin nodes
role-admin/cluster/mon1.example.com.sls
role-admin/cluster/mon2.example.com.sls
role-admin/cluster/mon3.example.com.sls

#CEPH Master node
role-master/cluster/admin.example.com.sls

#CEPH Manager nodes
role-mgr/cluster/mon1.example.com.sls
role-mgr/cluster/mon2.example.com.sls
role-mgr/cluster/mon3.example.com.sls

#CEPH Monitor nodes
role-mon/cluster/mon1.example.com.sls
role-mon/cluster/mon2.example.com.sls
role-mon/cluster/mon3.example.com.sls

#CEPH RGW nodes
role-rgw/cluster/admin.example.com.sls
```

```
role-rgw/cluster/mon1.example.com.sls
role-rgw/cluster/mon2.example.com.sls
role-rgw/cluster/mon3.example.com.sls

#CEPH Storage nodes
role-storage/cluster/admin.example.com.sls
role-storage/cluster/mon1.example.com.sls
role-storage/cluster/mon2.example.com.sls
role-storage/cluster/mon3.example.com.sls
```

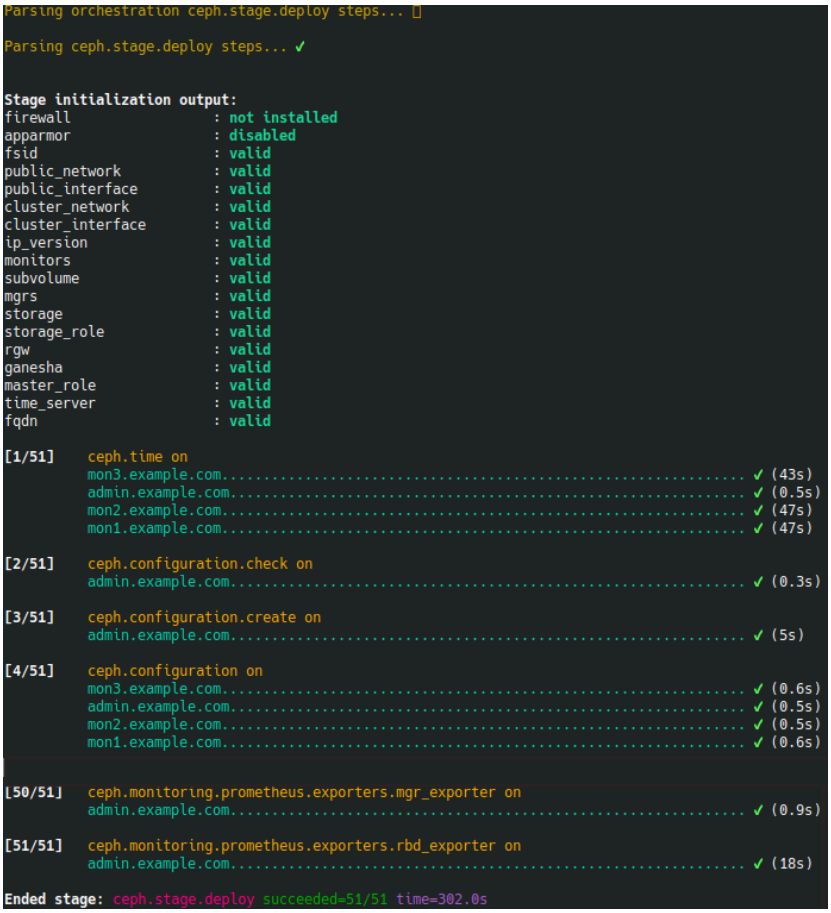
5. You can now safely deploy your configuration:

```
# salt-run state.orch ceph.stage.configure
```



6. Deploy your configuration to the cluster:

```
# salt-run state.orch ceph.stage.deploy
```



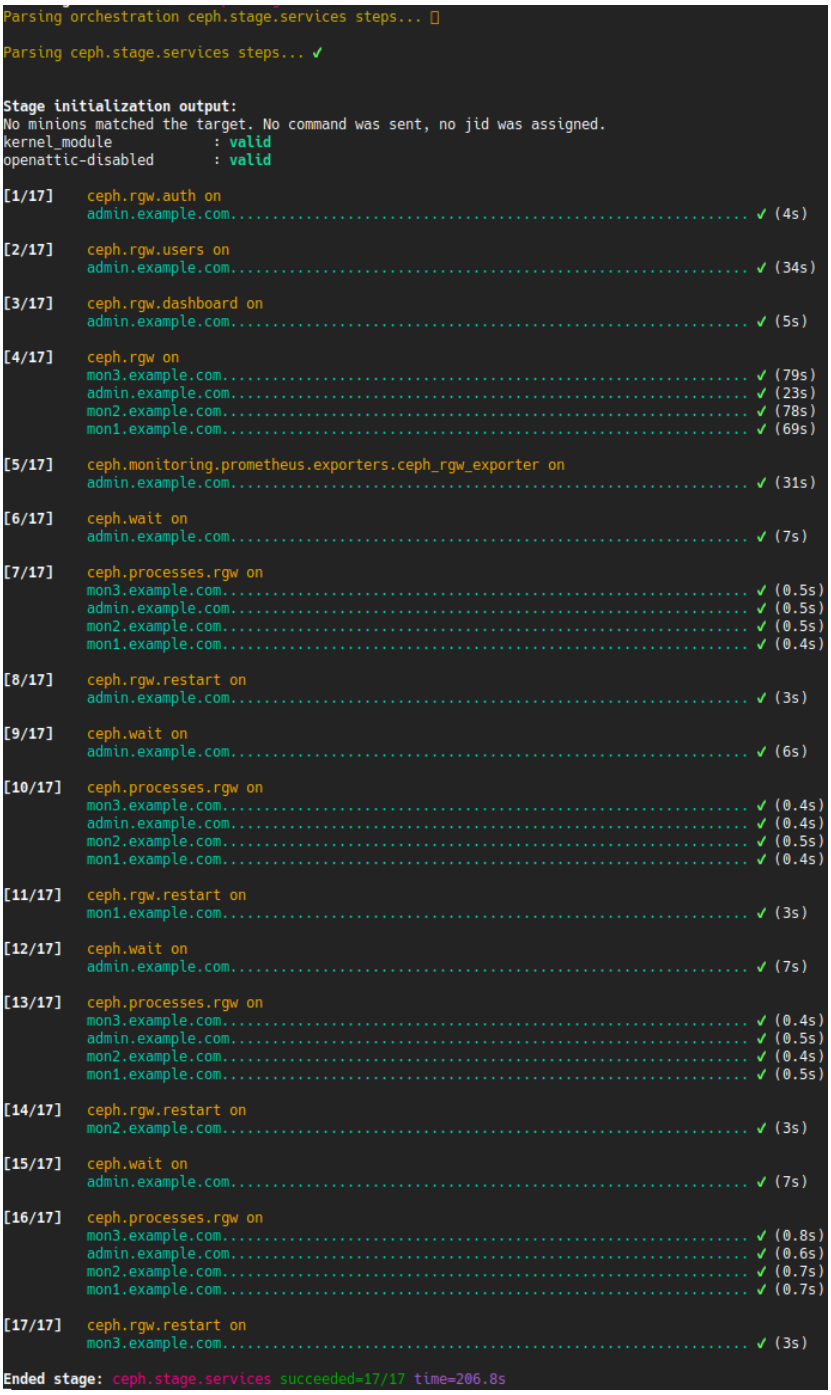

7. When the deployment stage has been successfully passed, check the cluster health to insure that all is running properly.

```
# ceph -s
```

```
ses55-admin:~ #  ceph -s
  cluster:
    id:     520a906e-e6a3-324f-ba18-856c2e155395
    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:
```

8. The last stage to run is deploying the service roles, which were specified in the `policy.cfg` file:

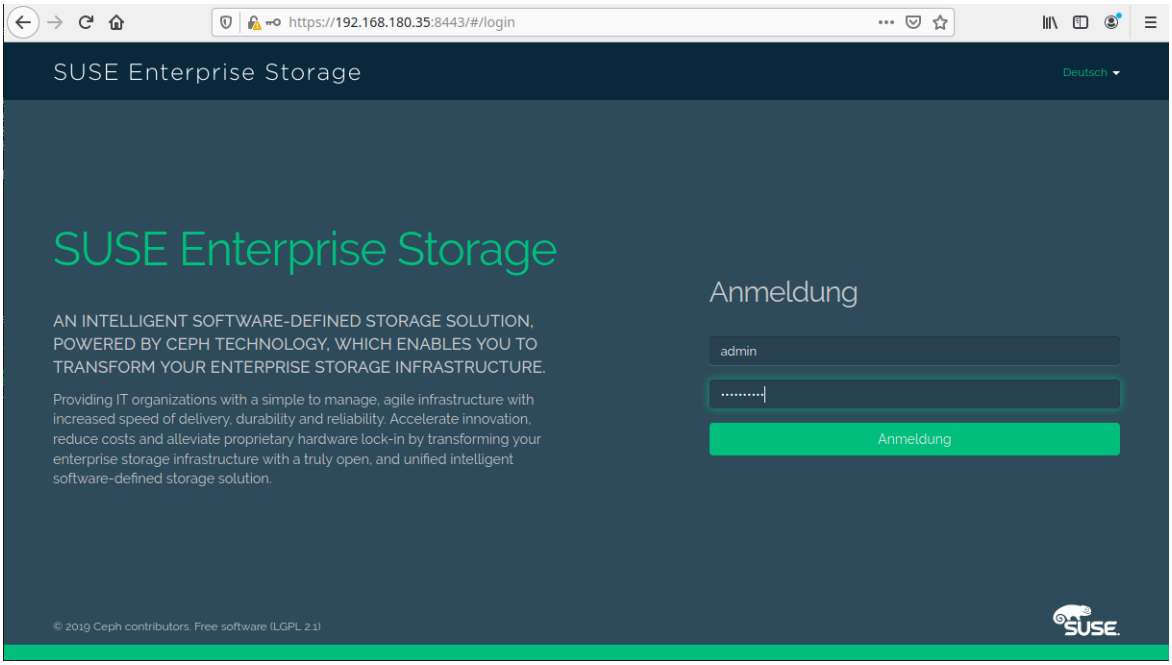
```
# salt-run state.orch ceph.stage.services
```




## 5.4 Access the dashboard and create a new pool

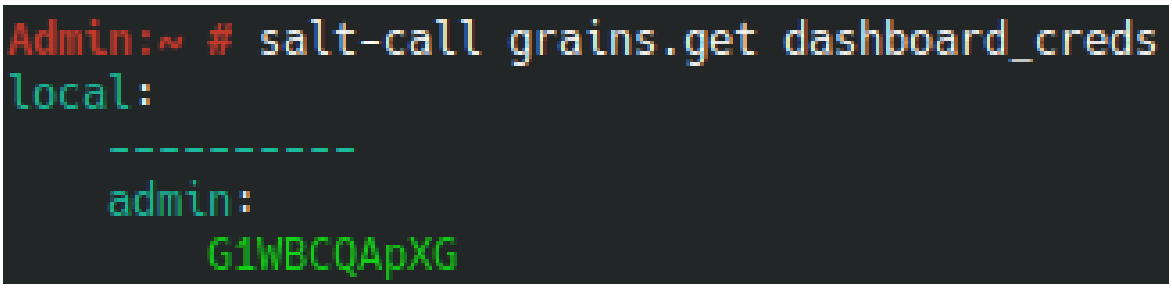
After the Ceph cluster is up and running, you must create a pool for SAP Data Intelligence 3. In our example, we will use the dashboard for this purpose.

1. The dashboard is published by any of the monitor nodes. To access it, use a Web browser:



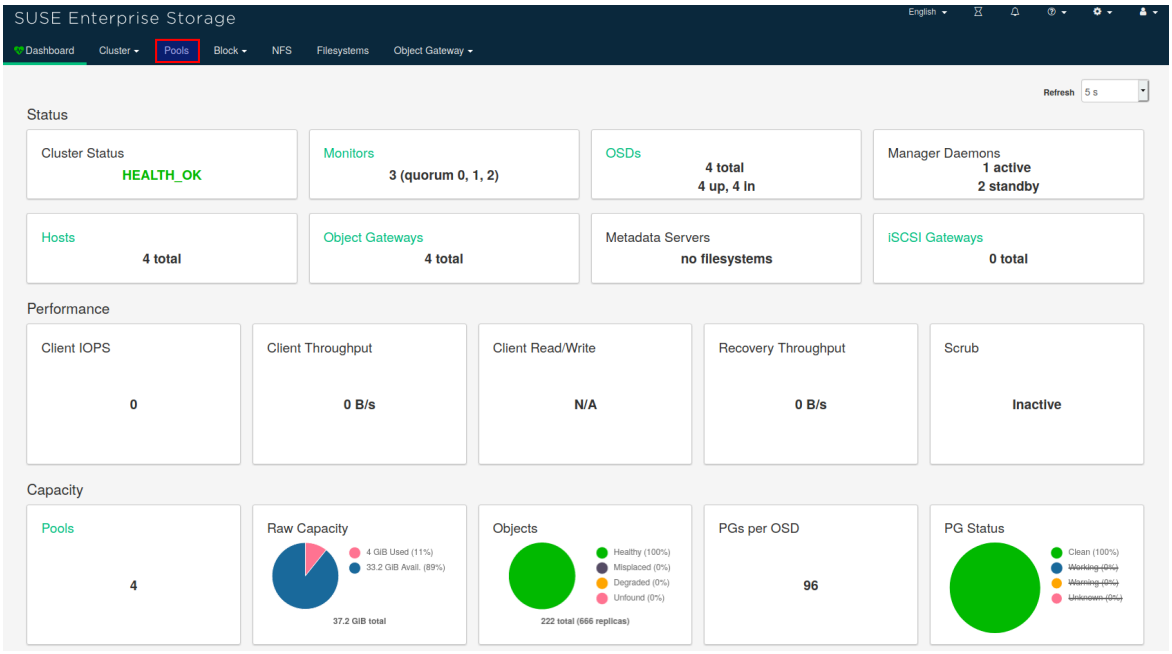

Get the credentials to log in by running the following command on the Admin Node:

```
# salt-call grains.get dashboard_creds
```



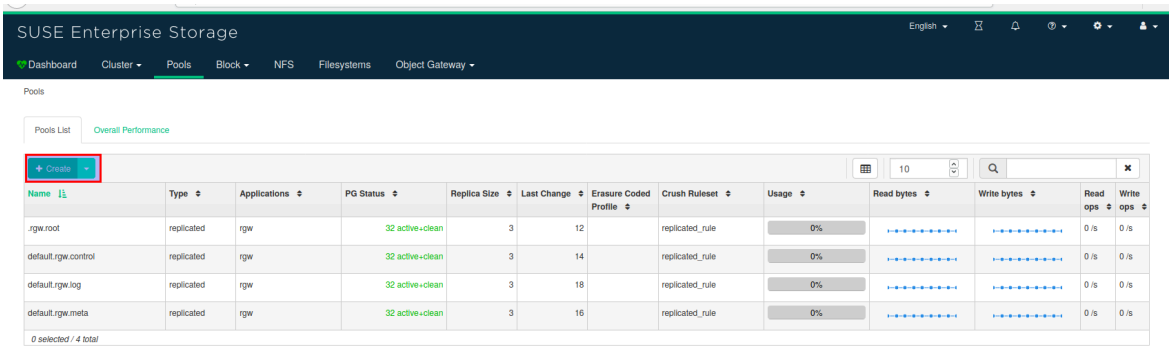
After logging in, the landing page should appear.

2. Select the "Pools" tab at the top of the page:




The Pools page gives an overview of the currently defined pools.

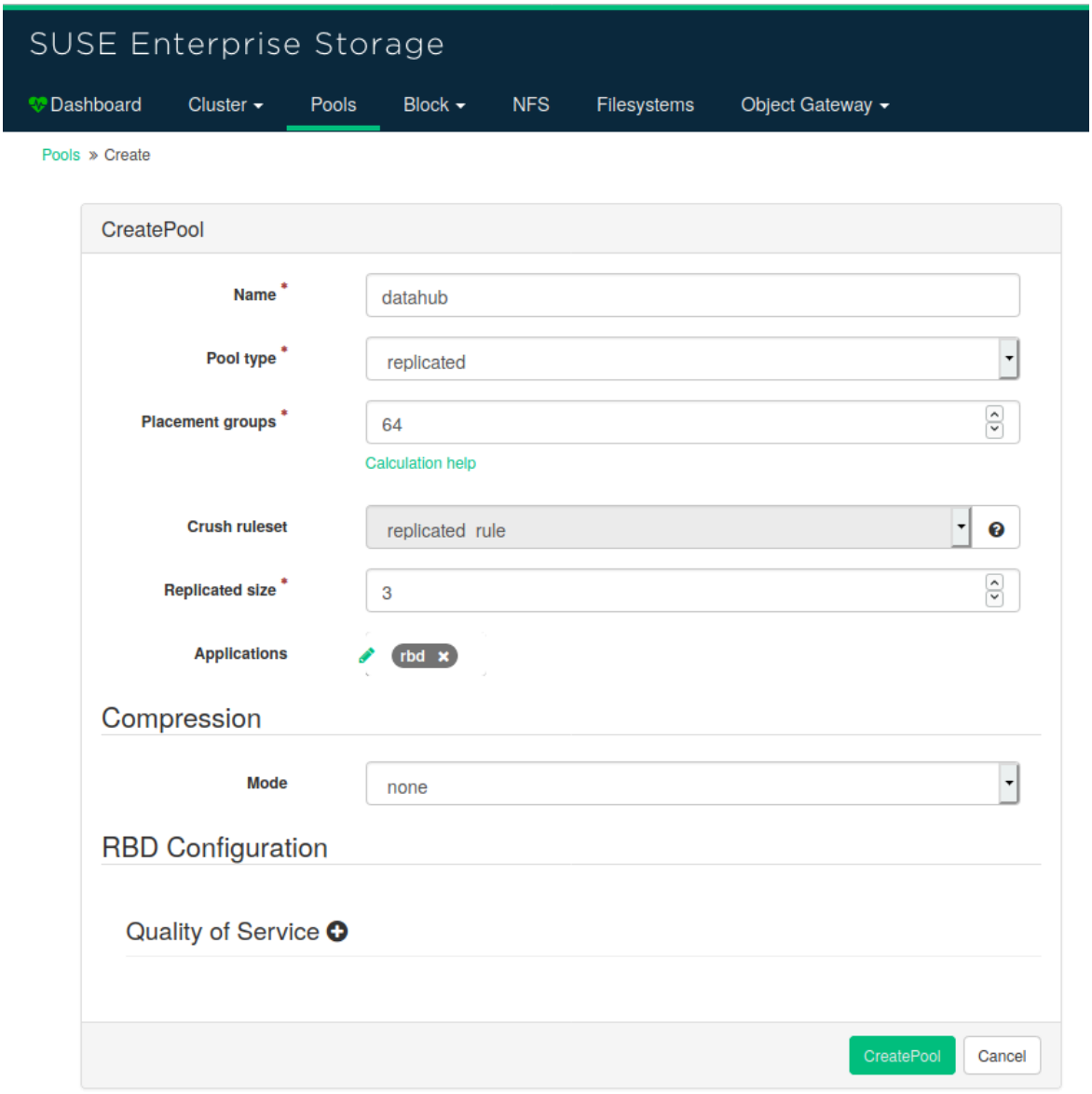
3. Click the "Create" button at the top of the table to create a new pool:




4. Enter the name of the pool. As "Pool type", select `replicated`.

5. On the left side of "Applications", click the pencil symbol and select `rbd`.

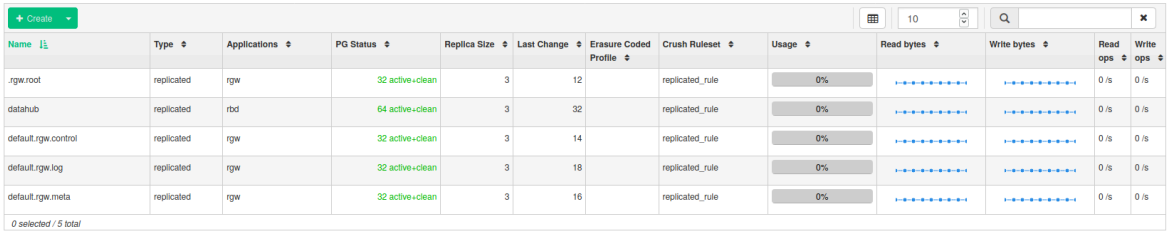
6. Confirm the creation of the pool by clicking the "CreatePool" button at the bottom.



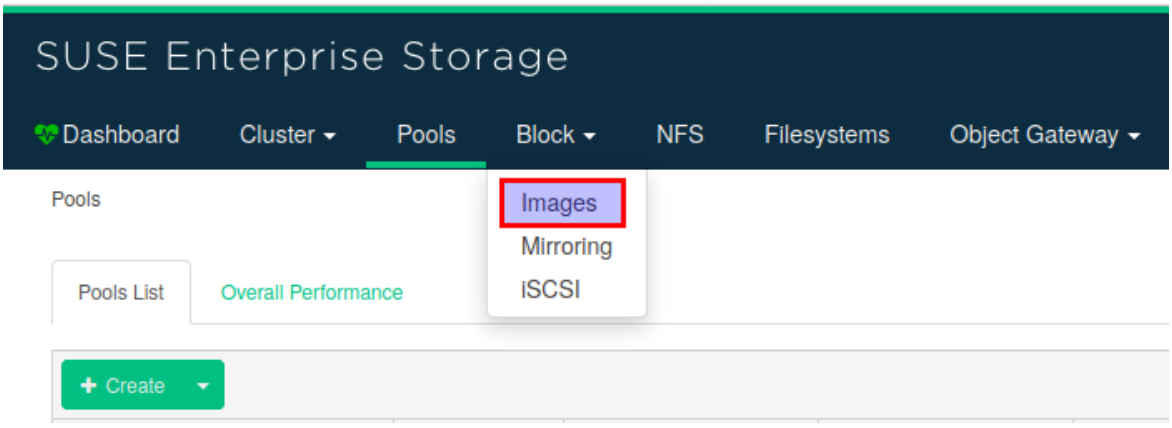

## Important

Make note of the name of the pool. It will be needed in *Section 6.4.1.2, "Creating Storage Class"*.

7. After this, the pools page is displayed again, and the newly created pool is shown in the table of pools.

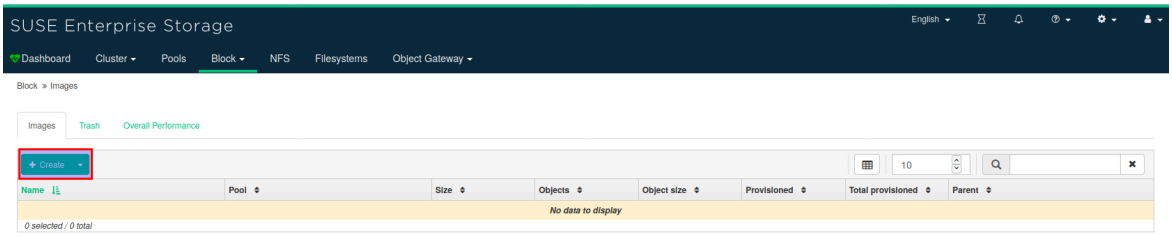



8. Now provide access to this pool through an RBD device. Go to the RDB overview page by selecting "Block→Images"

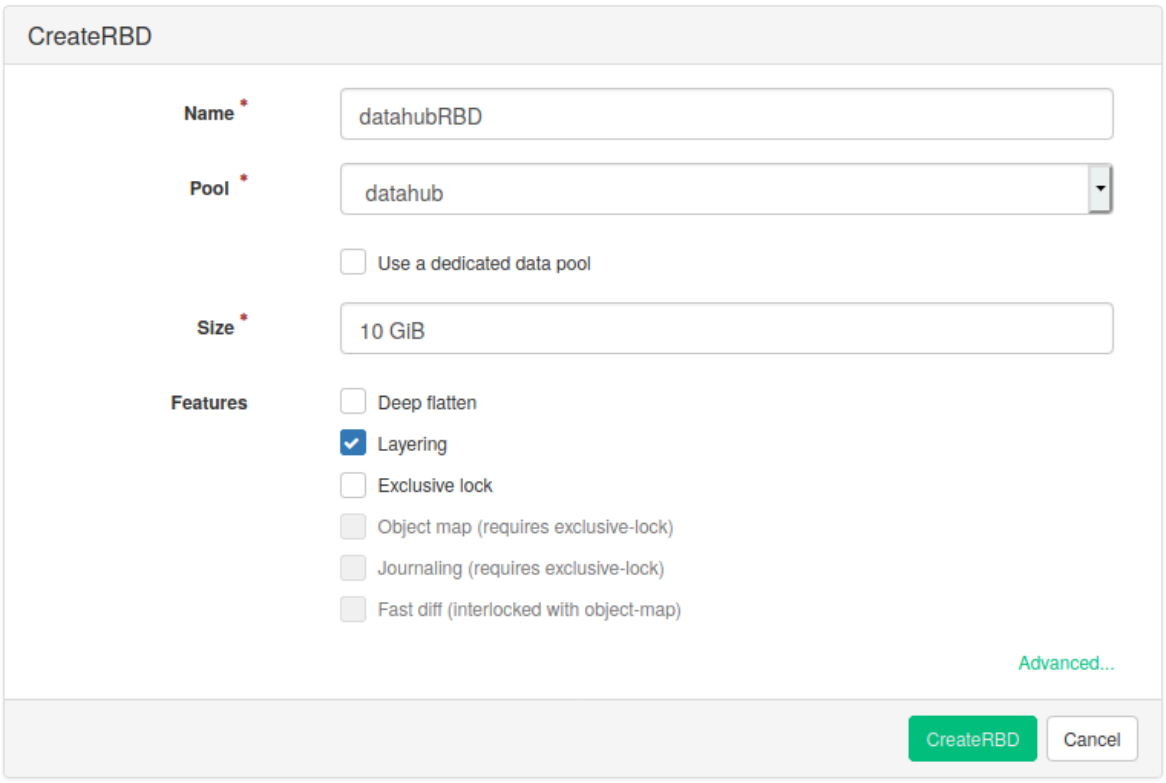



An overview of the configured RDBs is displayed.

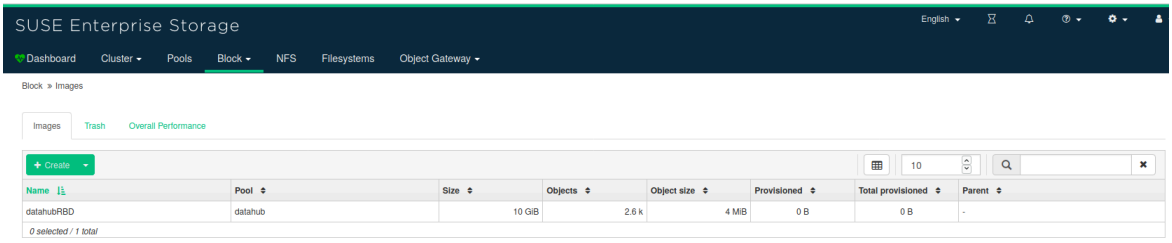
9. Click the **Create** button.




10. Enter the name, and if it is not already selected, select the previously created pool. Select the size of the RBD and confirm the creation by clicking the "CreateRBD" button.




The overview page of the RBDs is shown again. It now contains your newly created RBD.




At this point, the SUSE Enterprise Storage cluster is ready for usage with SAP Data Intelligence.

# 6 Installing SAP Data Intelligence 3 on top of SUSE CaaSP 4.2

## 6.1 Documentation

- SAP Notes:
  - Release Notes for SAP Data Intelligence 3 (https://launchpad.support.sap.com/#/notes/2871970)
  - Installation Guide for SAP Data Intelligence 3 (https://help.sap.com/viewer/a8d90a56d61a49718ebcb5f65014bbe7/3.0.latest/en-US)

## 6.2 Planning the installation with the SAP Maintenance Planner

For the installation of SAP Data Intelligence, you should start here: SAP Maintenance Planner (https://support.sap.com/en/alm/solution-manager/processes-72/maintenance-planner.html)

### Note

You need to have your SAP `S-User` available.

- The landing page of the SAP Maintenance Planner looks as follows:

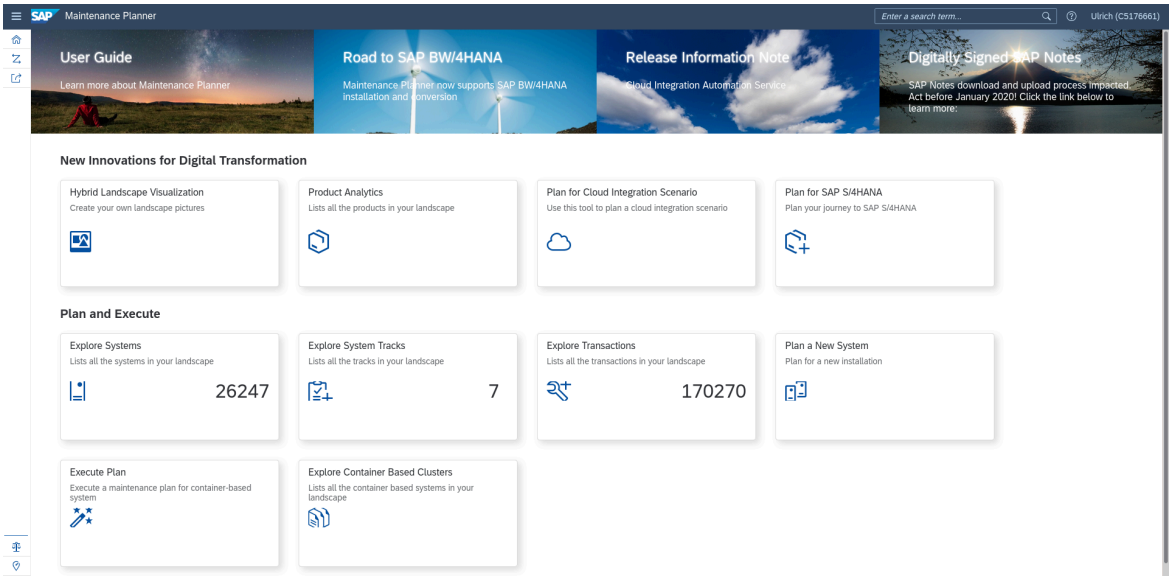



FIGURE 1: SAP MAINTENANCE PLANNER START PAGE

Click "Plan a New System" on the right.

- The next page displayed looks as follows:

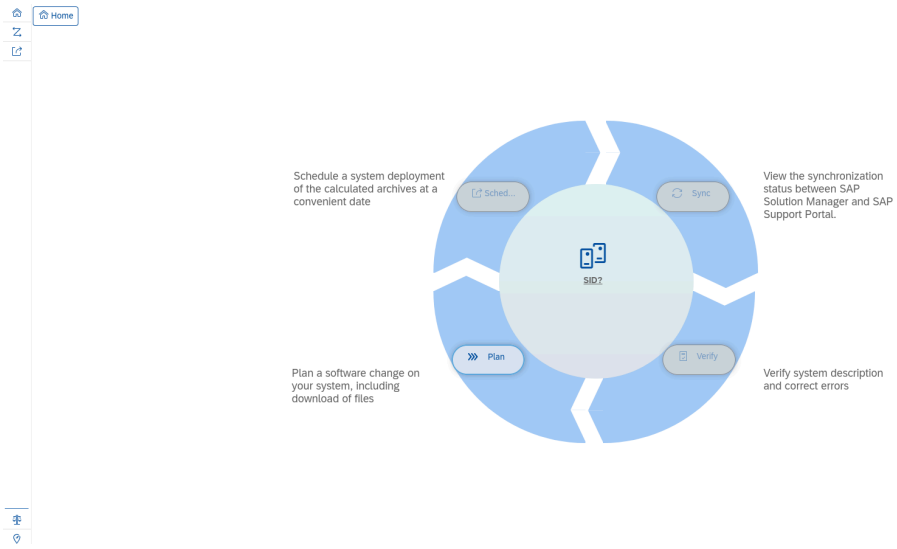



FIGURE 2: SAP MAINTENANCE PLANNER: SELECT PLAN

You will see a circle where all options except the option "Plan" are greyed out. Click the "Plan" option.

- The next page shows the "Define Change" step of your planning:

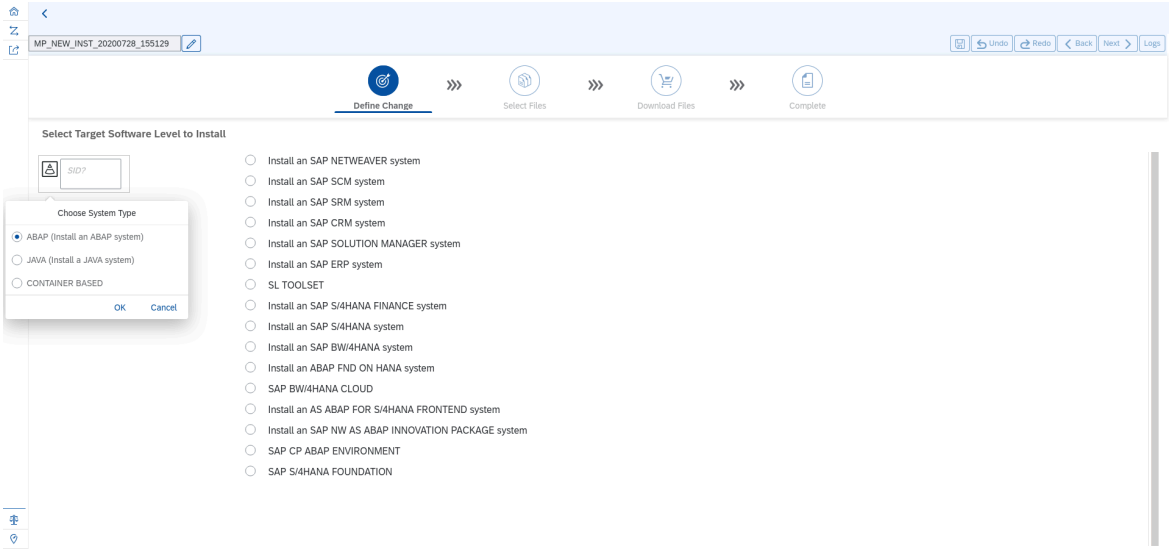



FIGURE 3: SAP MAINTENANCE PLANNER: SELECT CONTAINER BASED PRODUCT

- On the left, there is a window with three toggle buttons. Select "CONTAINER BASED" and click "OK":

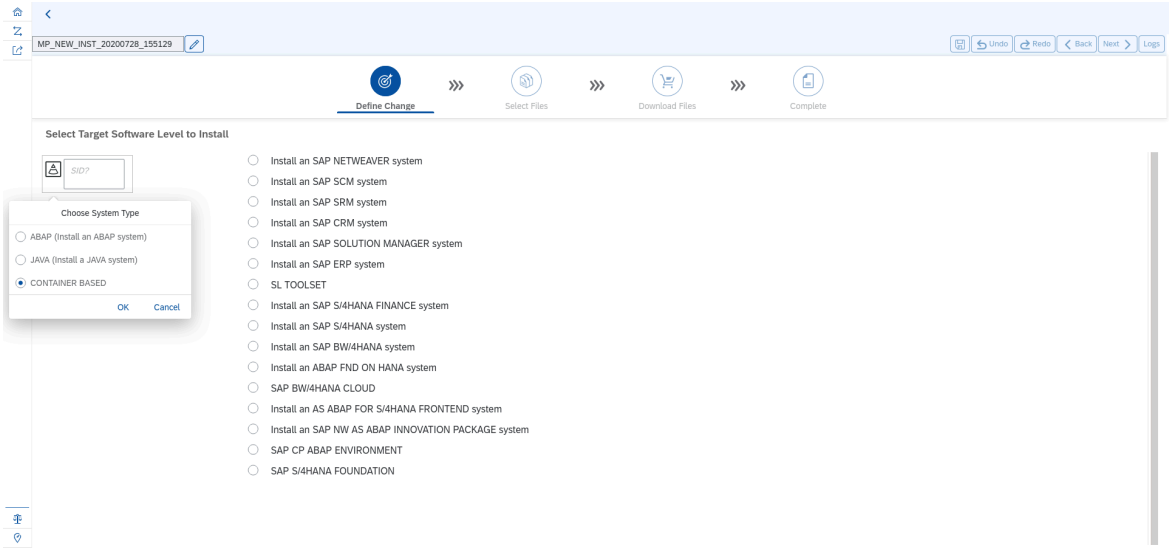



FIGURE 4: SAP MAINTENANCE PLANNER: SELECT CONTAINER BASED PRODUCT #2

- To the right, the option "SAP DATA INTELLIGENCE" should appear. When you select it, a sub-selection should open with choices for "SAP DATA INTELLIGENCE 3" and "SAP DATA HUB 2". Select "SAP DATA INTELLIGENCE 3":

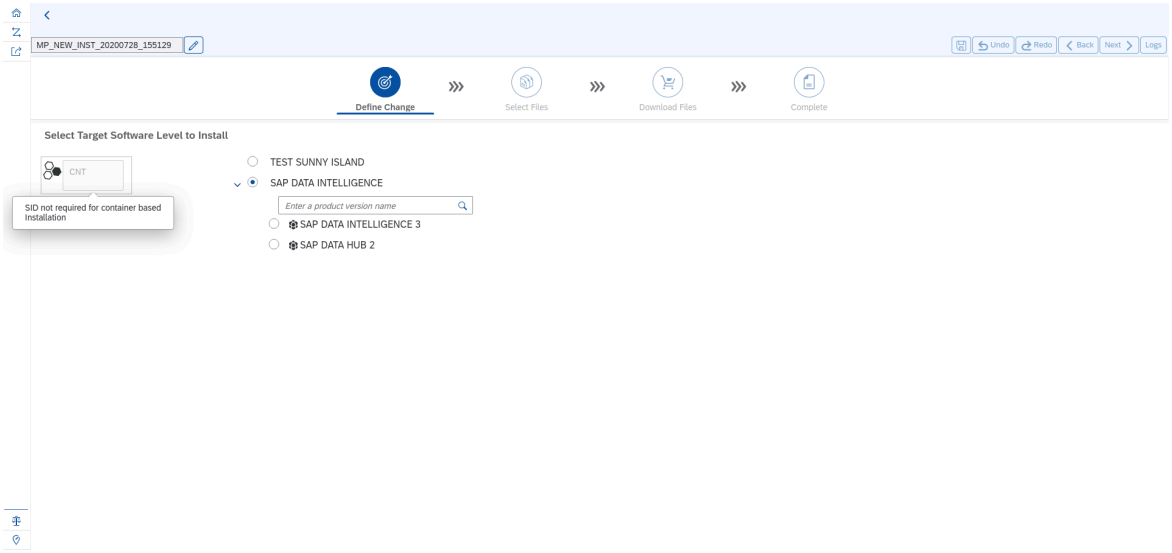



FIGURE 5: SAP MAINTENANCE PLANNER: SELECT DATA INTELLIGENCE 3

- A pop-up window will appear to inform you about the related SAP note. Click "Continue" to proceed:

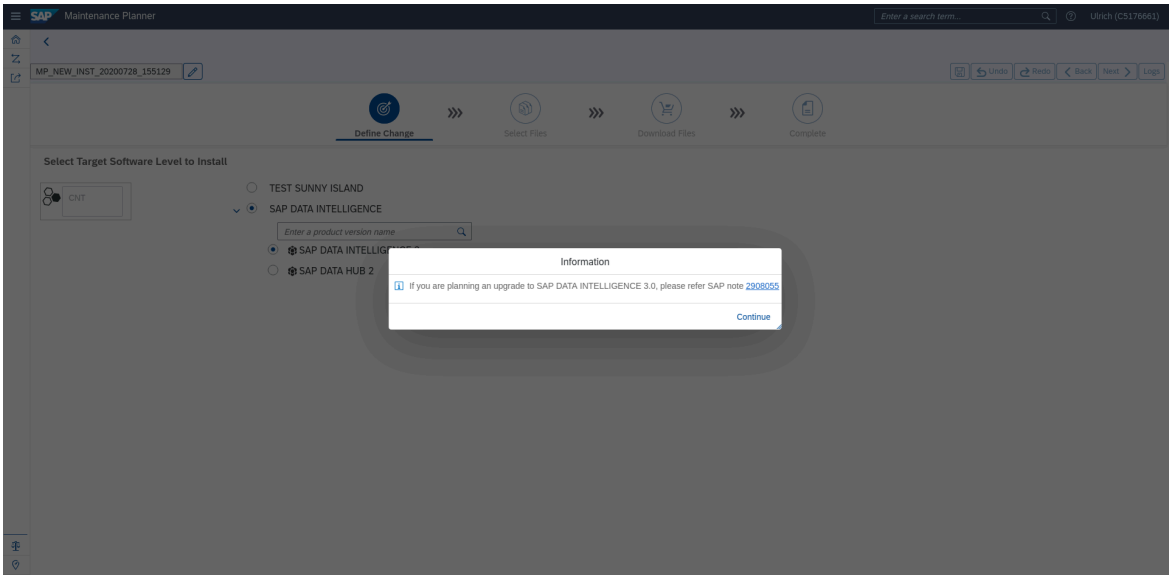



FIGURE 6: SAP MAINTENANCE PLANNER: SELECT CONTINUE

- On the right hand side, a drop-down box is shown with "Select Support Package Stack". Click this, and select from the available patch levels as needed:

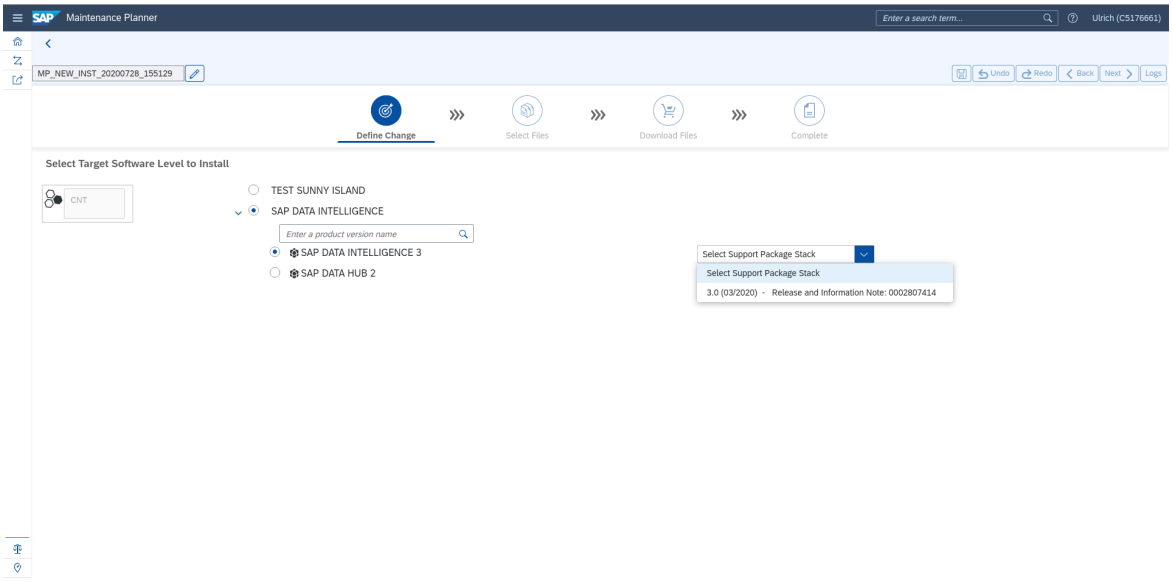



FIGURE 7: SAP MAINTENANCE PLANNER: SELECT FROM AVAILABLE PATCH LEVELS AS YOU NEED.

- To the left, the sub-selection for "SAP DATA INTELLIGENCE 3" will need changes. Select what you need and click the "Confirm Selection" at the very right:

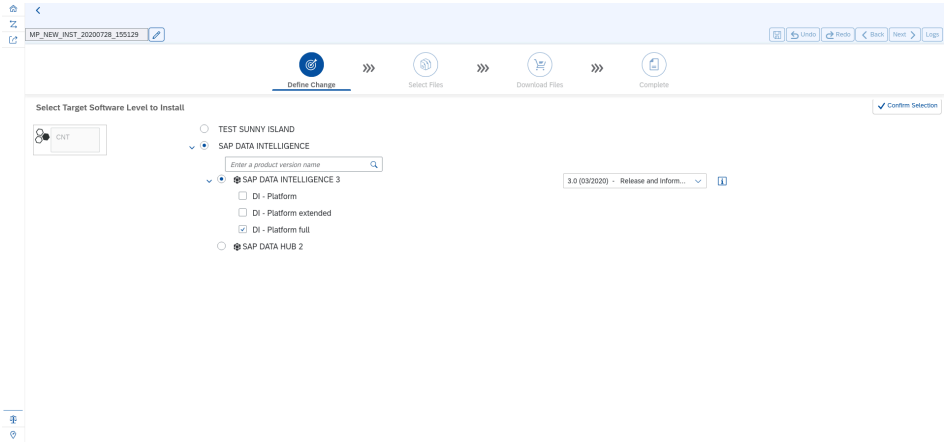



FIGURE 8: SAP MAINTENANCE PLANNER: SELECT ACCORDING YOUR NEEDS AND CONFIRM.

- An overview of your selection is shown. If this fits your needs, click the "Next" button at the upper right corner:

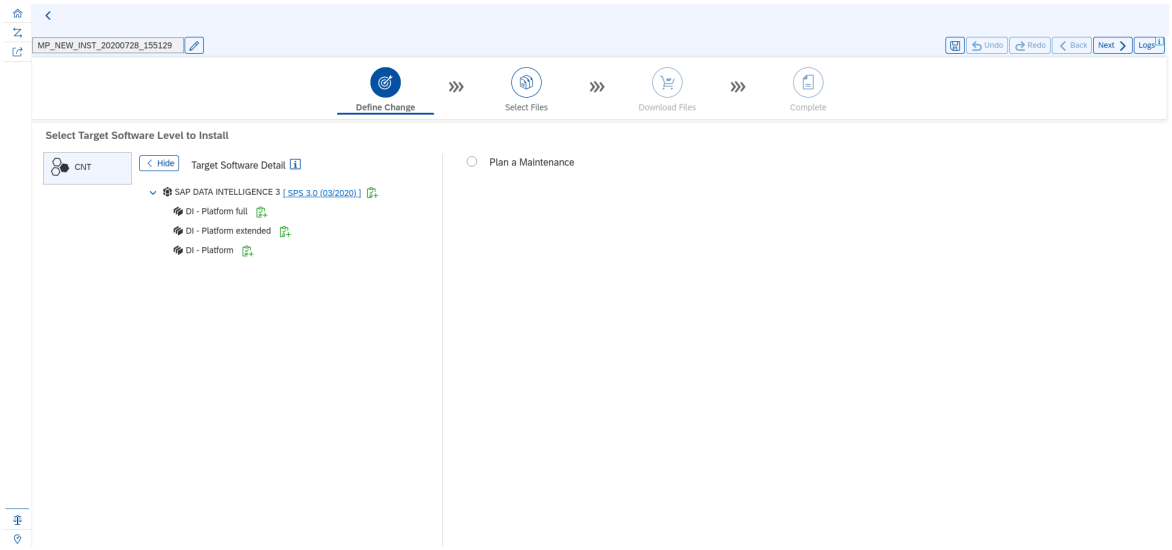



FIGURE 9: SAP MAINTENANCE PLANNER: SELECT NEXT IF SATISFIED

- Next, select the operating system upon which SAP Data Intelligence will be installed. Select "Linux on x86_64 64bit" and click "Confirm Selection":

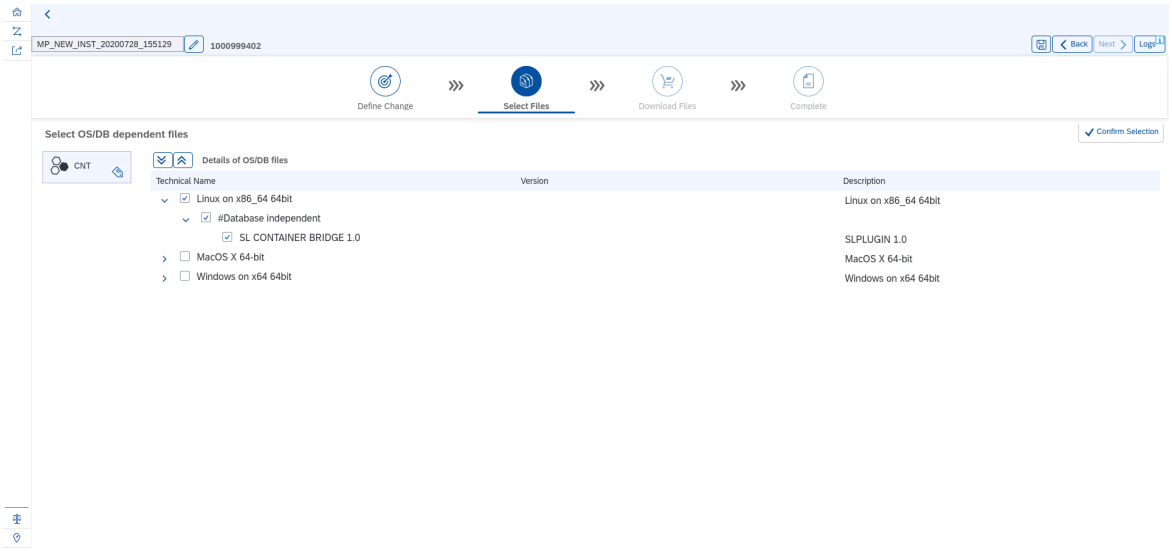



FIGURE 10: SAP MAINTENANCE PLANNER: SELECT LINUX AND CONFIRM

- The next page shows the preselected files to use and download. Again, click the "Next" button on the upper right:

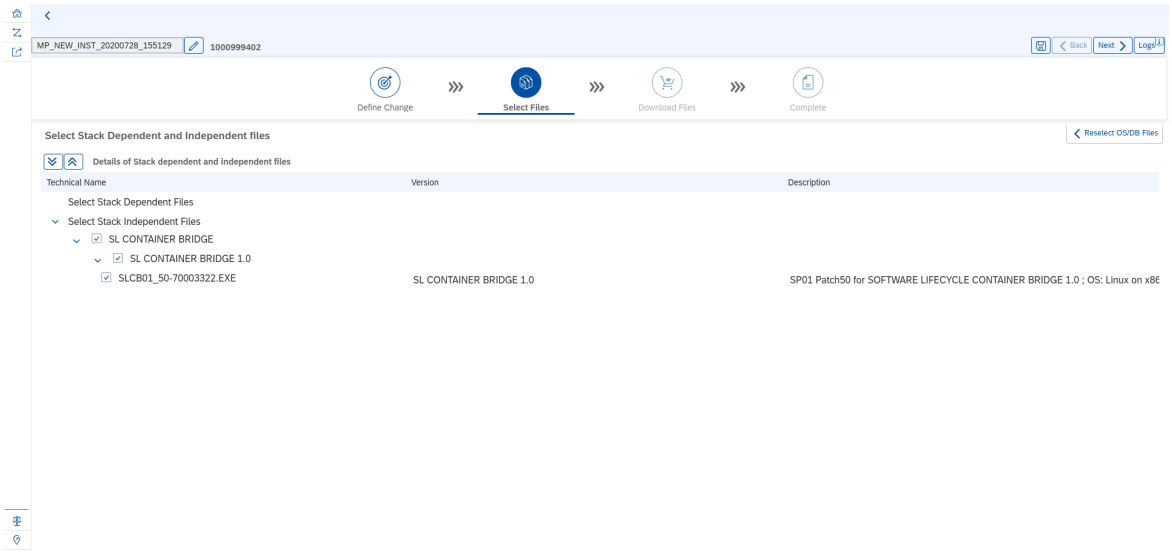



FIGURE 11: SAP MAINTENANCE PLANNER: CONFIRM

- You should now arrive at the "Download Files" page. The required **SLC bridge** is already preselected. Click "Next" to proceed:

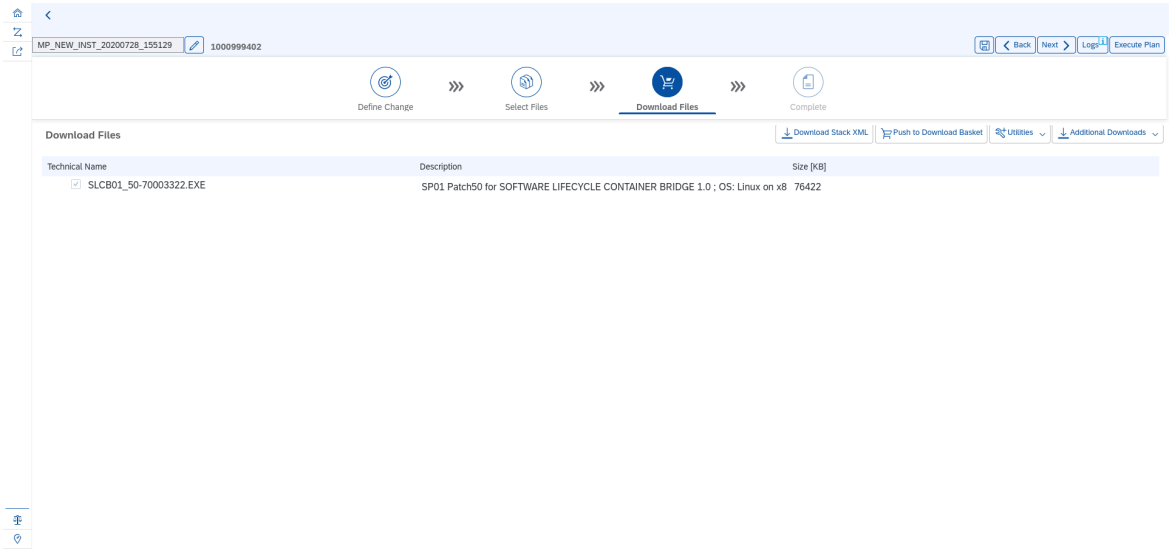



FIGURE 12: SAP MAINTENANCE PLANNER: EXECUTE PLAN

- Your maintenance plan is shown as PDF. Confirm everything by clicking the "Execute Plan" button on the upper right side:

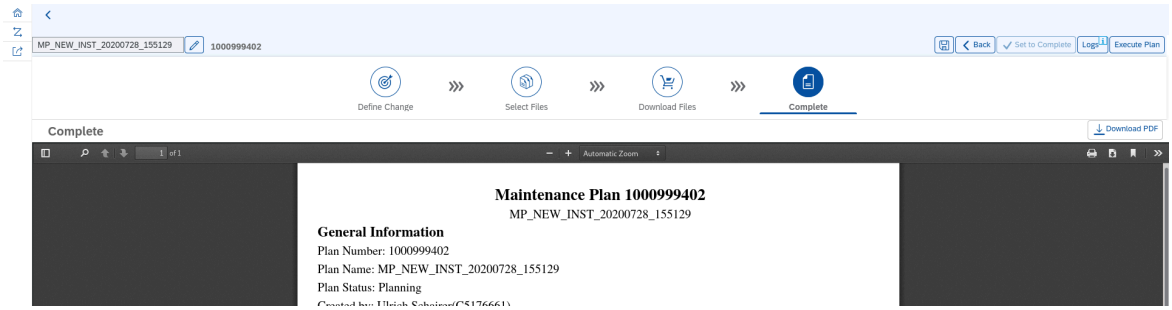



FIGURE 13: SAP MAINTENANCE PLANNER: DOWNLOAD STACK.XML AND SLC BRIDGE INSTALLER

- Download the **SLC Bridge Installer** and copy it to your management workstation. You will need this file in *Section 6.3, "Installing the SAP SLC Bridge"*.

- You will be prompted to enter the FQDN and the port of the machine your SLC bridge will run on:

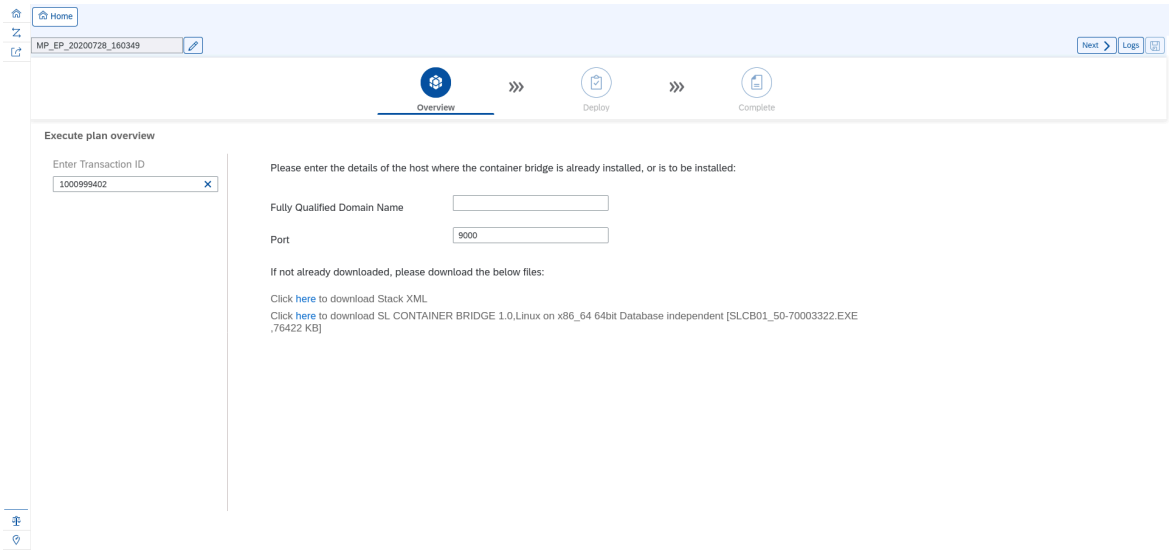



FIGURE 14: SAP MAINTENANCE PLANNER: ENTER FQDN OF HOST WHERE THE SLC BRIDGE WILL RUN

- Fill in the values. An example looks as follows:

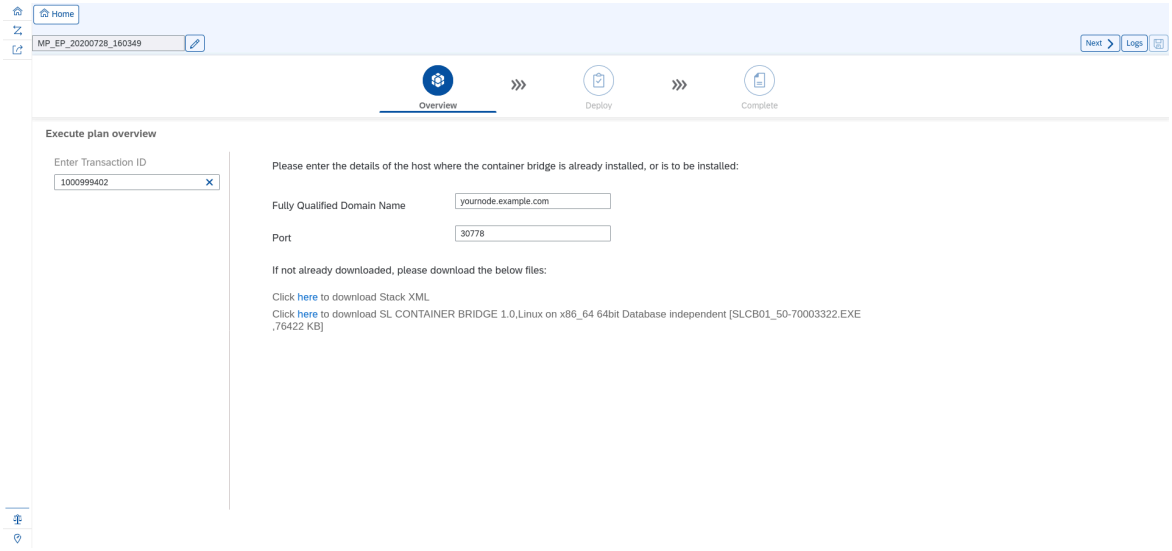



FIGURE 15: SAP MAINTENANCE PLANNER: EXAMPLE FOR HOST AND PORT

## 6.3 Installing the SAP SLC Bridge

- Download the file containing the SLC Bridge Installer.
- If you have not already done so, copy this file to the management workstation.
- Run the **SLC Bridge Installer** on the management workstation.

```
$ ./SLCB01_<YOUR DOWNLOADED VERSION>.EXE init
```

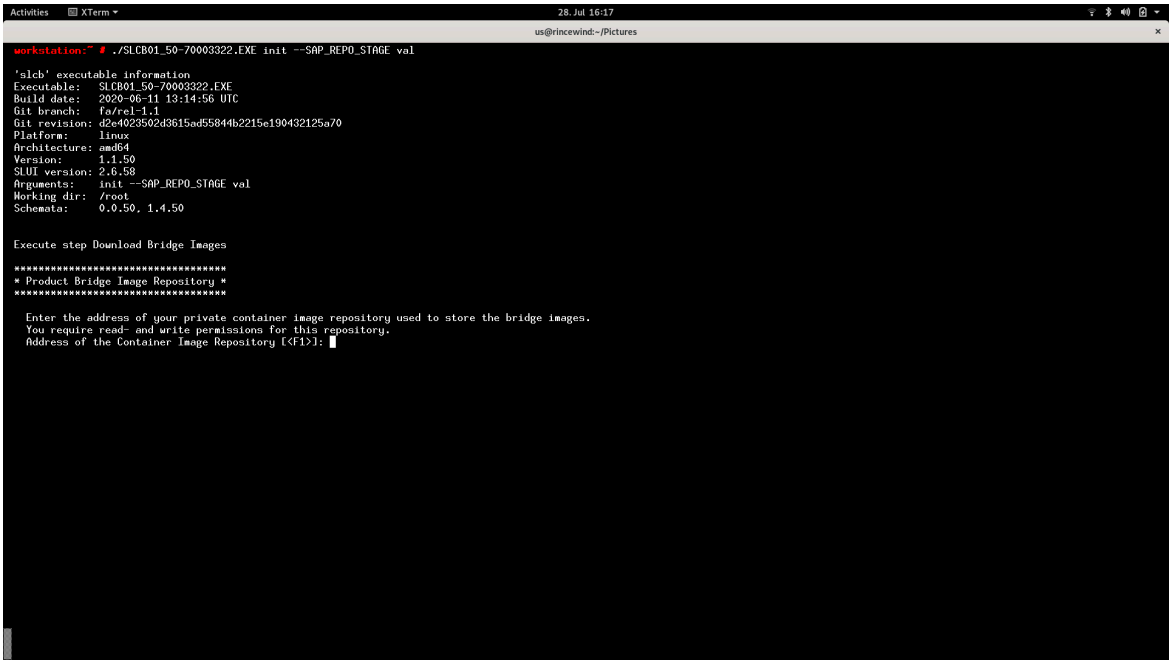



FIGURE 16: SAP SLC BRIDGE

- This interactive script gathers all the necessary information to run the SAP SLC Bridge, and at the end, deploys it into the CaaSP cluster.

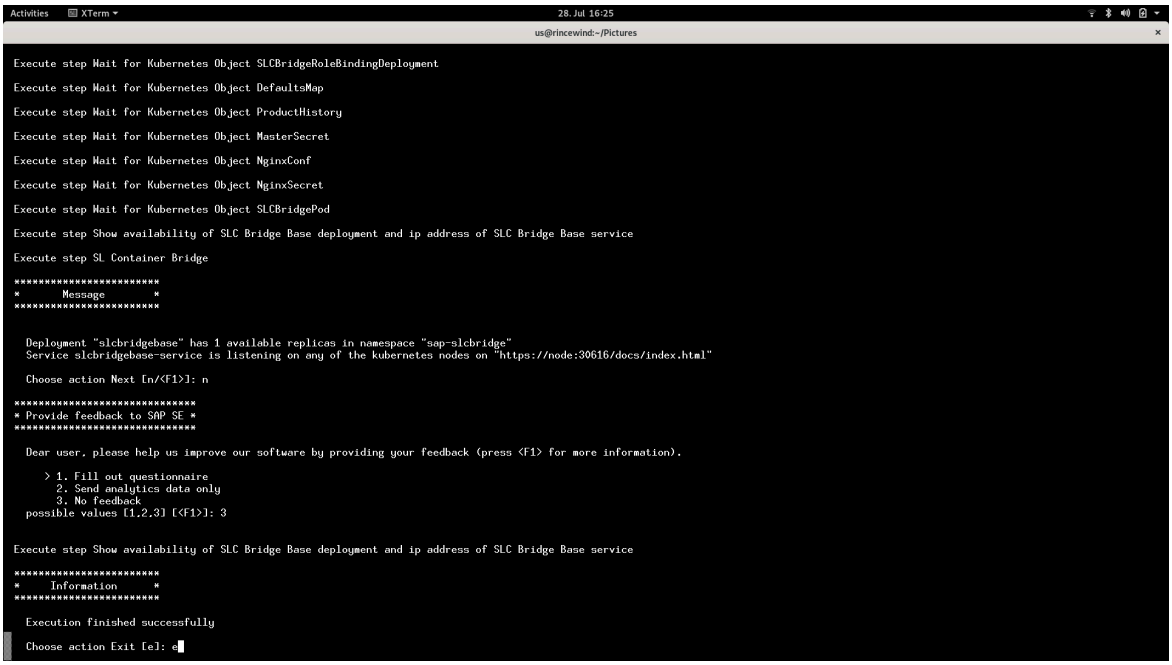



FIGURE 17: SAP SLC BRIDGE

- Identify the service port for the SLC Bridge:

```
# kubectl -n sap-slcbridge get pods
NAME                                READY   STATUS    RESTARTS   AGE
di-platform-full-product-bridge   2/2     Running   0          3d23h
slcbridgebase-858f895bd6-74gps    2/2     Running   1          10d
# kubectl -n sap-slcbridge get svc
NAME                                        TYPE        CLUSTER-IP     EXTERNAL-IP
 PORT(S)          AGE
di-platform-full-product-bridge-service   ClusterIP   10.101.2.224   <none>
 9000/TCP         3d23h
slcbridgebase-service                     NodePort    10.97.79.26    <none>
 9000:30778/TCP   10d
```

  In our example, the port number on which the SLC Bridge listens is `30778`.

- Make a note of this information. It is needed for the installation process via SAP Maintenance Planner.

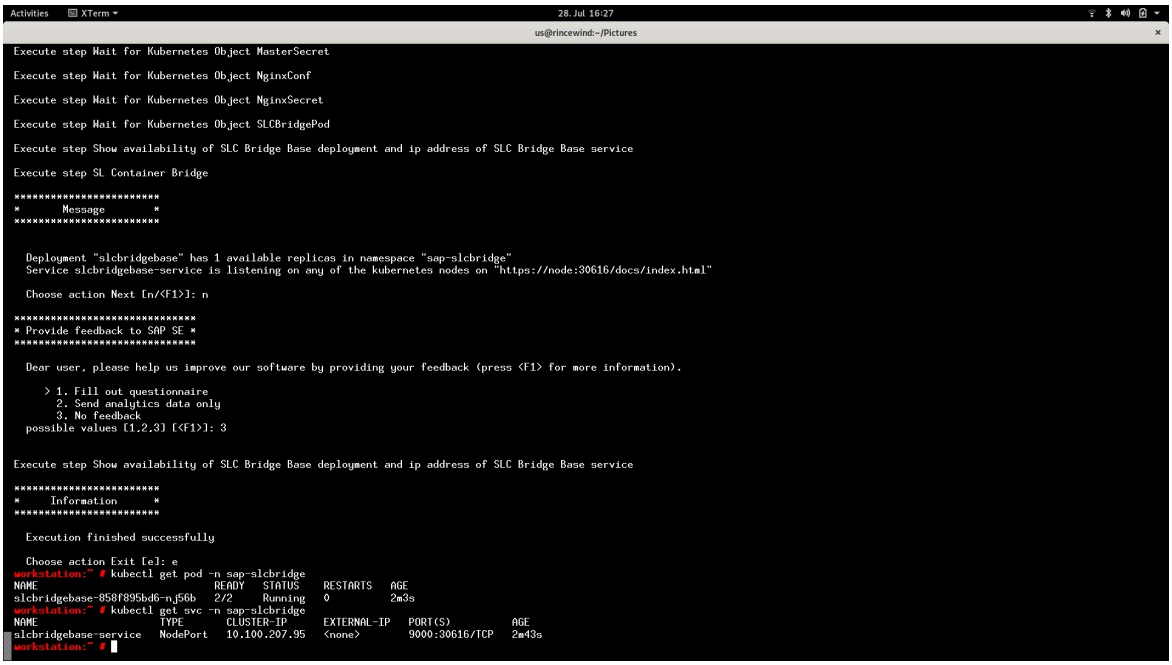



FIGURE 18: SAP SLC BRIDGE

## 6.4 Installing SAP Data Intelligence 3

This section describes the installation of SAP Data Intelligence 3 on top of SUSE CaaSP 4.2.

### 6.4.1 Preparations

Before the installation of SAP DI 3 can start, some preparation work must be done:

- Create a namespace on the Kubernetes cluster.
- Define a (default) storage class on the Kubernetes cluster.
- Adapt `PodSecurityPolicies`.
- Create the necessary `ClusterRoleBindings`.
- If you use self-signed certificates for the private registry, a special secret must be created.

#### Note

Unless otherwise specified, all these tasks are run from the management workstation.

#### 6.4.1.1 Creating namespace for SAP Data Intelligence 3 on Kubernetes

Define the namespace into which SAP Data Intelligence 3 will be installed:

```
$ kubectl create namespace <YOUR NAMESPACE>
```

#### 6.4.1.2 Creating Storage Class

- Create the storage class to provide volumes for SAP Data Intelligence 3 on SUSE Enterprise Storage.
- Make sure that you have:
  - the connection data for your SUSE Enterprise Storage at hand
  - the IP addresses and port number (default: 6789) of the monitor nodes of your SES cluster
  - created a data pool on your SES cluster for use with SAP Data Intelligence 3
  - the name of this pool (`datahub` in this example) available
- Edit the example below to fit your environment.

```
$ cat > storageClass.yaml <<EOF
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
```

- Create secrets for the StorageClass.
  - Create the secrets needed to access the storage.
  - Obtain the keys from your SES cluster. These are located in `ceph.admin.keyring` and `ceph.user.keyring`.
    You must encode the keys with `base64`.

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

```
$ cat > ceph-admin-secret.yaml <<EOF
apiVersion: v1
kind: Secret
metadata:
    name: ceph-admin-secret
type: "kubernetes.io/rbd"
data:
   key: <YOUR BASE64 ENCODED KEY HERE>
EOF
```

```
$ cat > ceph-user-secret.yaml <<EOF
apiVersion: v1
kind: Secret
metadata:
    name: ceph-user-secret
type: "kubernetes.io/rbd"
data:
   key: <YOUR BASE64 ENCODED KEY HERE>
EOF

$ kubectl apply -f ceph-admin-secret.yaml
$ kubectl apply -f ceph-user-secret.yaml
```

  - Create the credentials for accessing the StorageClass from the namespace where DI 3 will be installed into.

```
$ kubectl -n <YOUR NAMESPACE FOR DI 3> create -f ceph-admin-secret.yaml
$ kubectl -n <YOUR NAMESPACE FOR DI 3> create -f ceph-user-secret.yaml
```

#### 6.4.1.3 Creating PodSecurityPolicies and ClusterRoleBindings

- PodSecurityPolicies

```
$ kubectl edit psp suse.caasp.psp.privileged
```

Change the `pathPrefix` in `allowedHostPaths` to `/`

- ClusterRoleBindings

```
$ cat > clusterrolebinding.yaml << EOF
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: suse:caasp:psp:privileged:default
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: suse:caasp:psp:privileged
subjects:
- kind: ServiceAccount
  name: default
  namespace: XXX
- kind: ServiceAccount
  name: vora-vsystem-XXX
  namespace: XXX
- kind: ServiceAccount
  name: vora-vsystem-XXX-vrep
  namespace: XXX
- kind: ServiceAccount
  name: XXX-elasticsearch
  namespace: XXX
- kind: ServiceAccount
  name: XXX-fluentd
  namespace: XXX
- kind: ServiceAccount
  name: XXX-nodeexporter
  namespace: XXX
- kind: ServiceAccount
  name: vora-vflow-server
  namespace: XXX
- kind: ServiceAccount
  name: mlf-deployment-api
  namespace: XXX
EOF
$ sed -i s/XXX/<your-di-namespace>/g clusterrolebinding.yaml
$ kubectl apply -f clusterrolebinding.yaml
```

- Additional changes

```
$ kubectl edit clusterrolebinding system:node
```

Insert the following at the end of the file:

```
subjects:
- apiGroup: rbac.authorization.k8s.io
  kind: Group
  name: system:nodes
```

- If you use self-signed SSL certificates for the secure private registry, create a secret for accessing this registry.

**Note**

The certificate chain should be saved in `pem` format into a single file called `cert`.

```
export NAMESPACE=<your namespace>
mv cert cert_with_carriage_return
tr -d '\r' < cert_with_carriage_return > cert
kubectl create secret generic cmcertificates --from-file=cert -n $NAMESPACE
```

### 6.4.2 Installing SAP Data Intelligence 3

After you successfully finished the preparation stages, proceed with the installation of SAP Data Intelligence 3. To do so, several steps must be executed.

#### 6.4.2.1 Connecting to the SLC Bridge

- Point your browser to the SLC Bridge service:
  - https://<yournode>:<yourport>/docs/index.html
- Fill in your credentials you created during the deployment of the SLC Bridge.

### 6.4.2.2 Installing the workflow

- Connect and authenticate to the SLC Bridge service created above. Use the credentials created during the setup of the SLC Bridge:

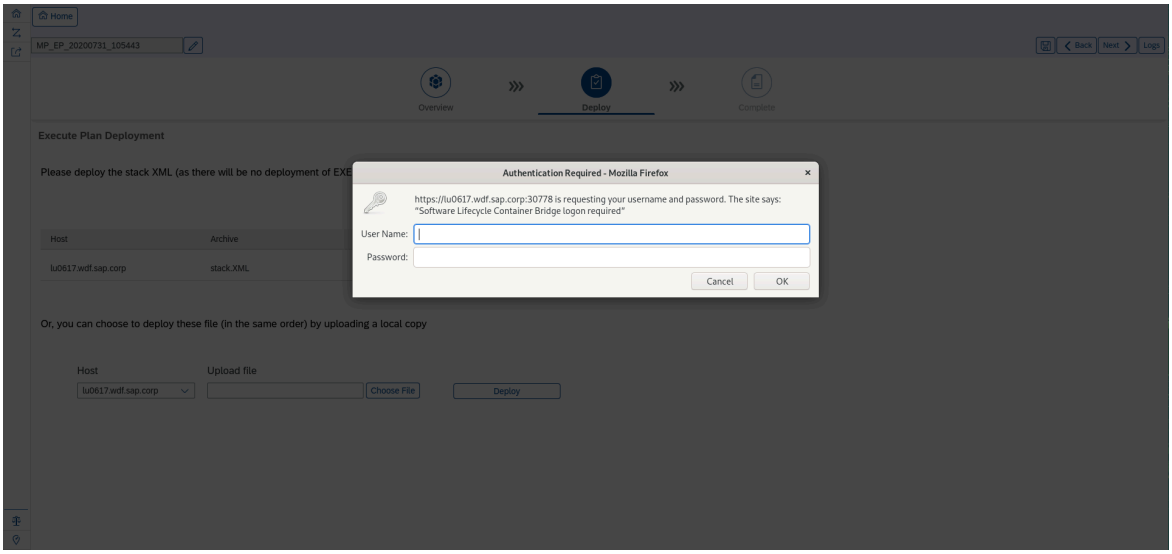



FIGURE 19: CONNECT AND AUTHENTICATE TO THE SLCB SERIVE

- Select "Planned software Changes":

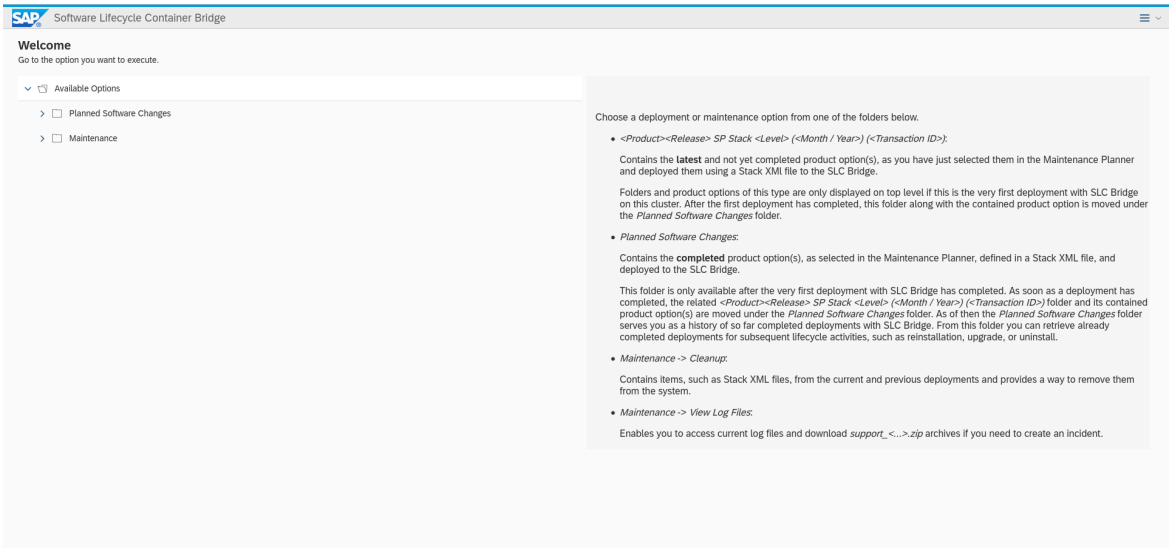



FIGURE 20: INSTALLATION SELECT PLANNED SOFTWARE CHANGES

- Select the SAP Data Intelligence deployment required by your needs. Click "Next":

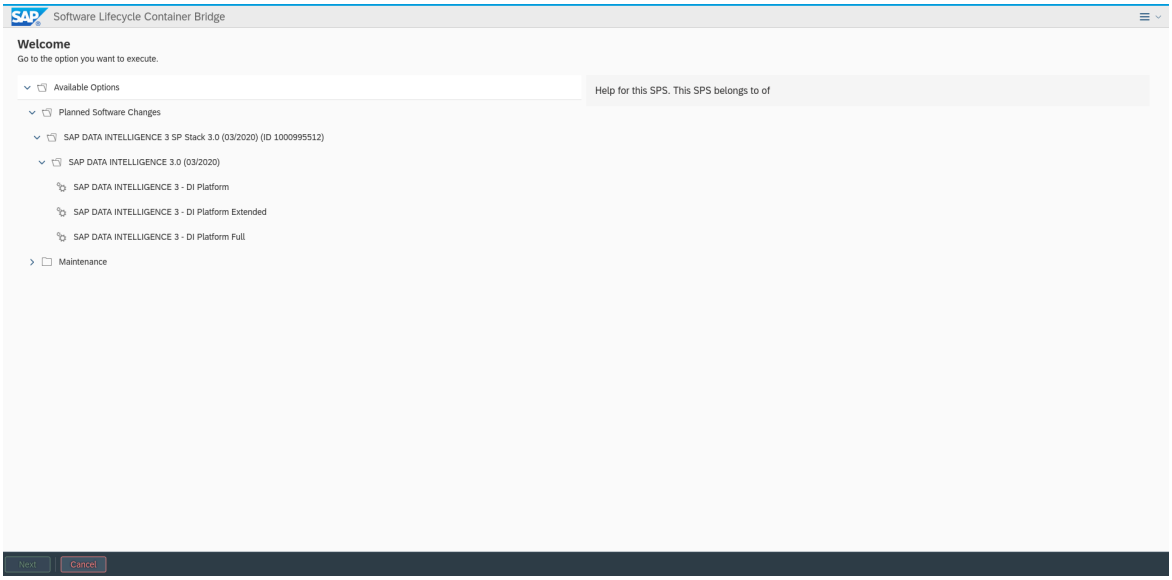



FIGURE 21: INSTALLATION SELECT THE SAP DI DEPLOYMENT YOU WANT TO INSTALL, FOR EXAMPLE SAP DI PLATFORM FULL

- Enter the Kubernetes namespace created beforehand, for example `di310`. Click "Next":

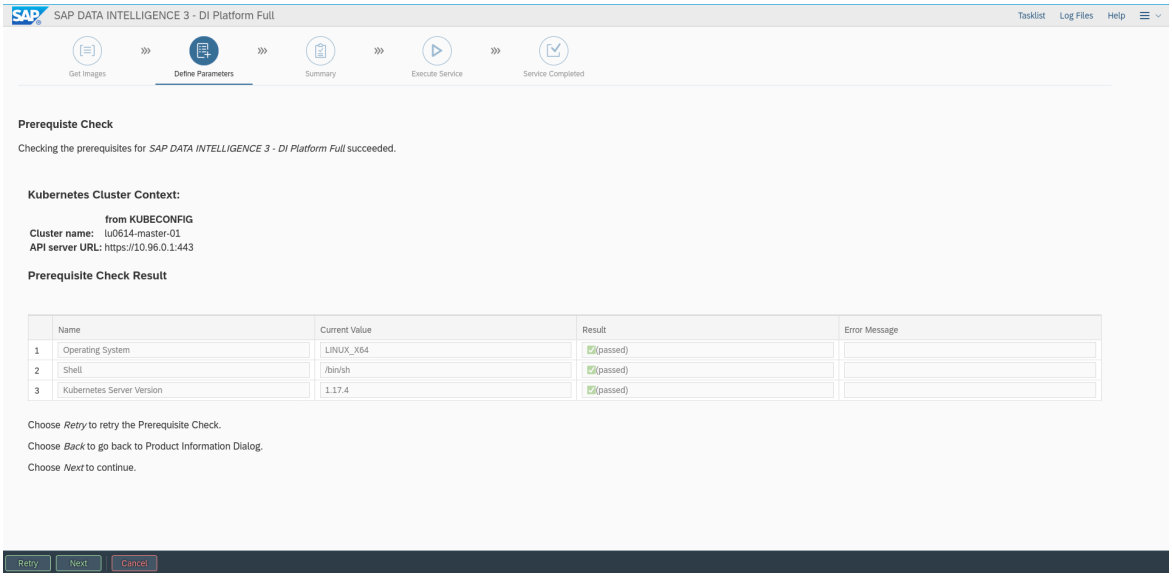



FIGURE 22: INSTALLATION PRE-REQUISITES CHECK

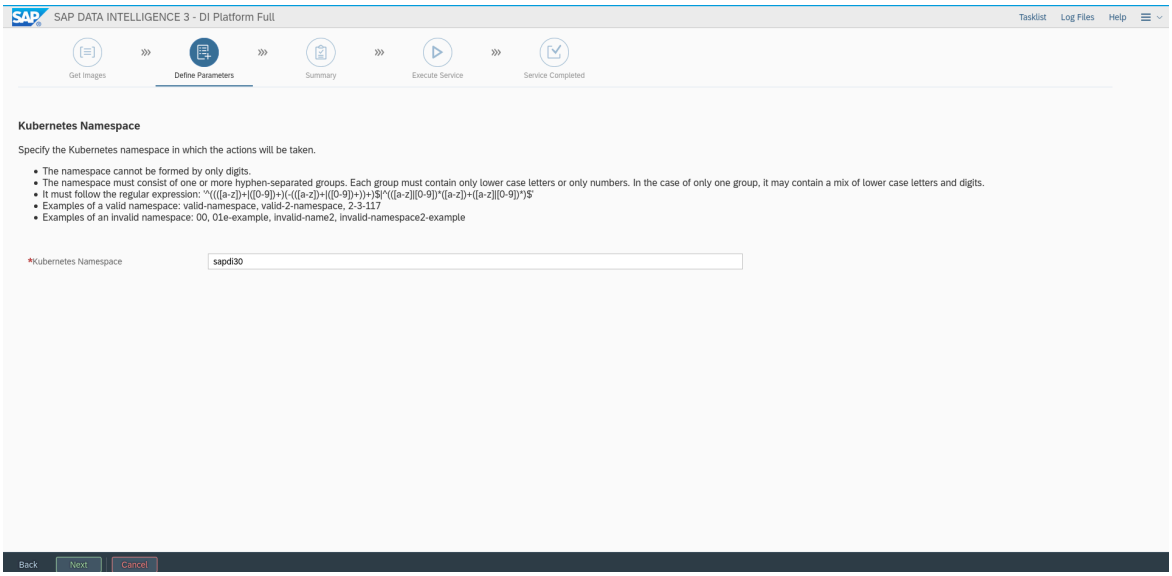



FIGURE 23: INSTALLATION ENTER KUBERNETES NAMESPACE

- Select "Advanced Installation":

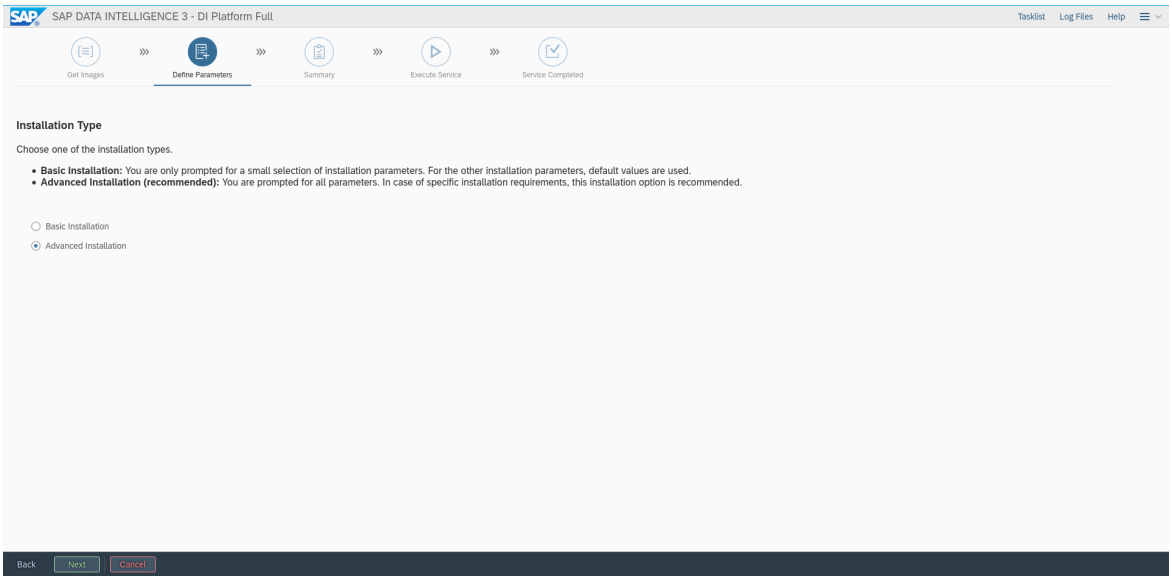



FIGURE 24: INSTALLATION SELECT ADVANCED INSTALLATION

- Enter the URI of your Private secure registry. Click "Next":

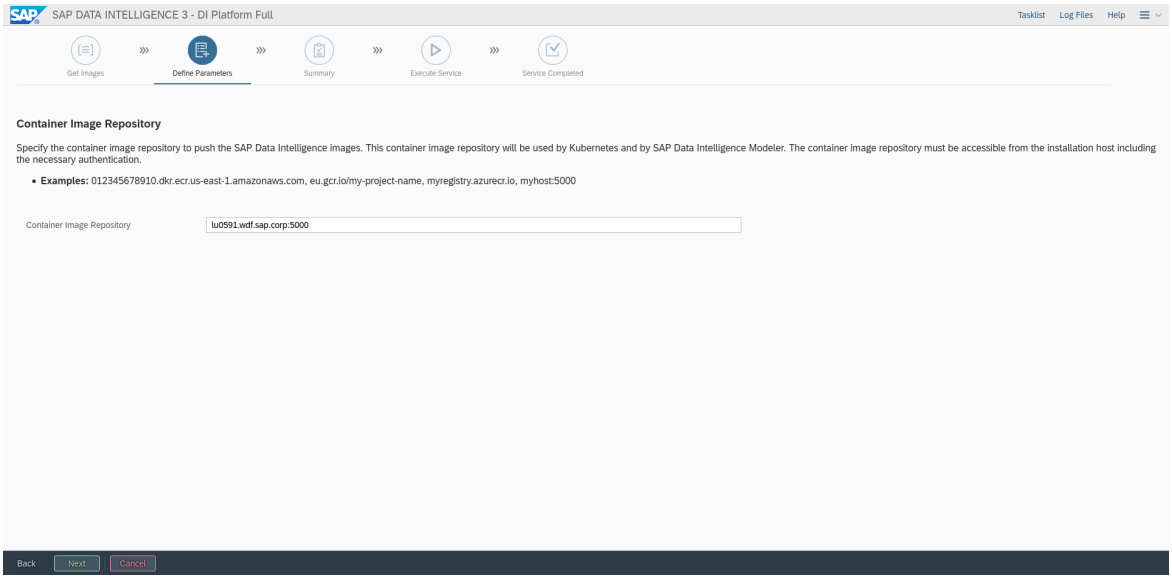



FIGURE 25: INSTALLATION PRIVATE CONTAINER REGISTRY

- Enter a password for the system tenant in SAP DI 3.0:

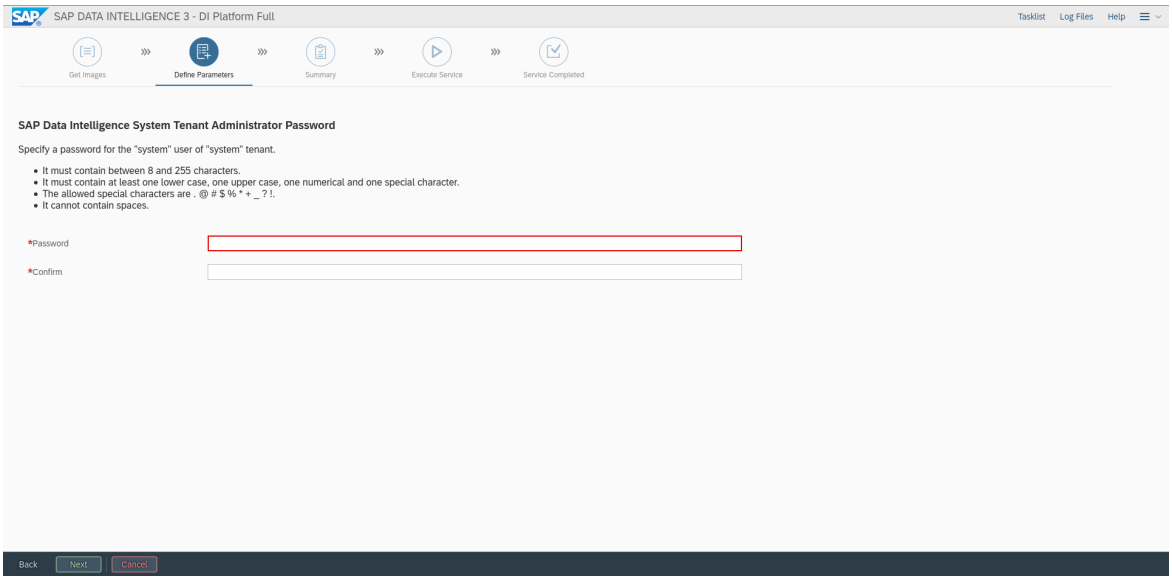



FIGURE 26: INSTALLATION SYSTEM TENANT PASSWORD

- Assign a name to the initially created tenant, for example "default":

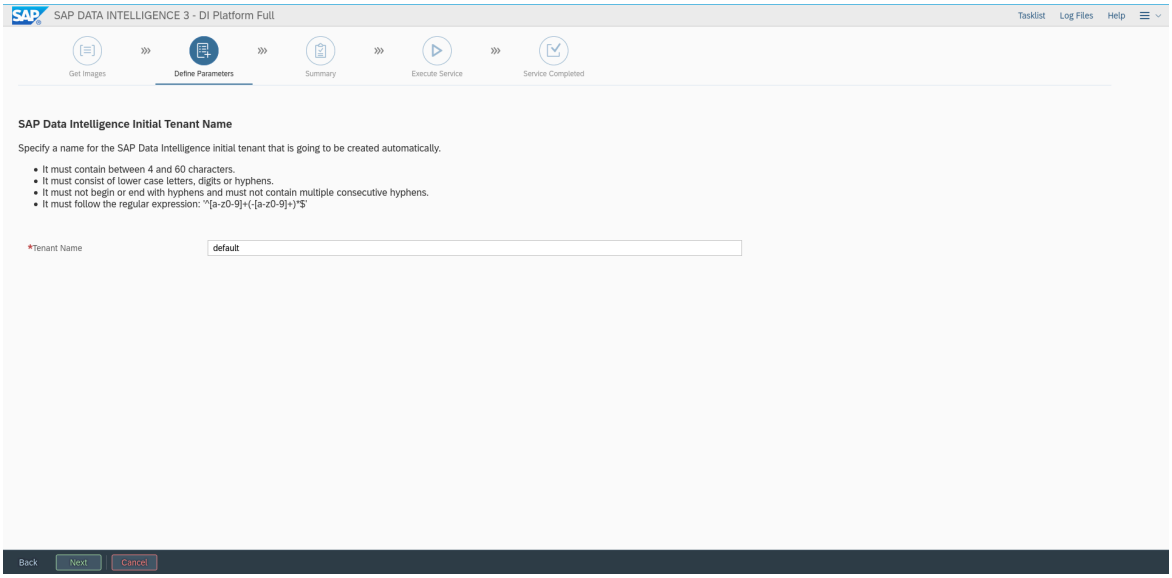



FIGURE 27: INSTALLATION CREATE DEFAULT TENANT

- Create the administrator user for the default tenant in SAP DI 3.0:

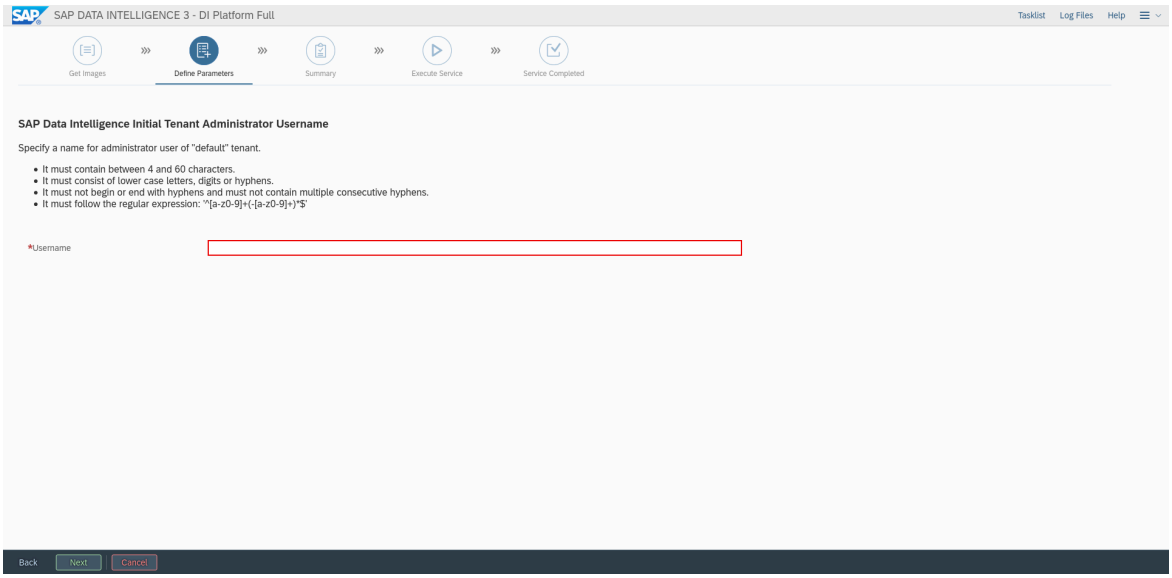



FIGURE 28: INSTALLATION ADMIN USER NAME OF DEFAULT TENANT

- Set the password for the administrator user of the default tenant:

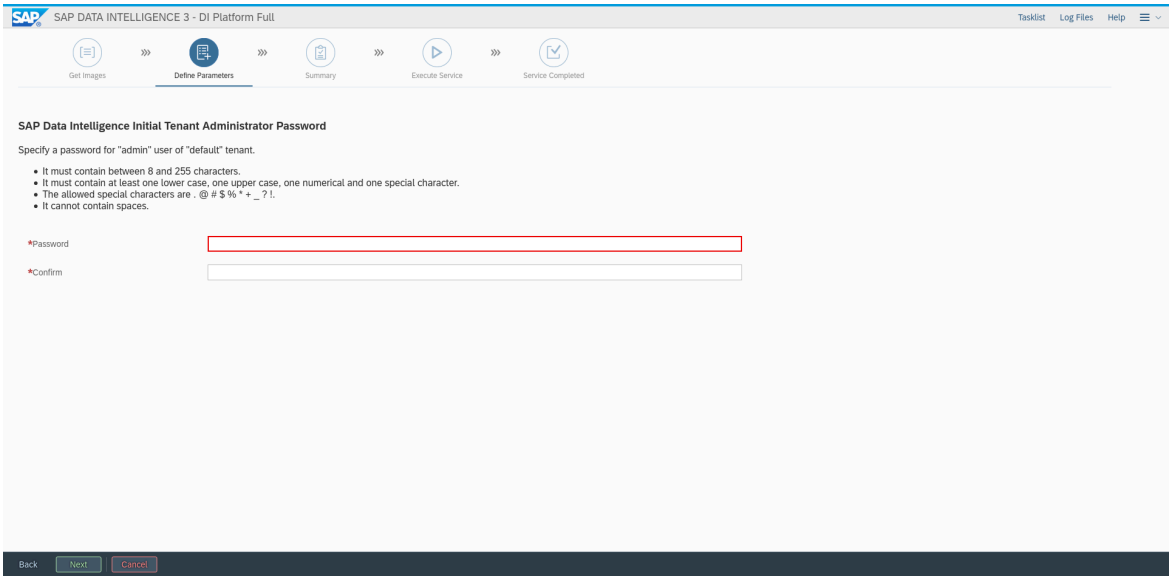



FIGURE 29: INSTALLATION SET ADMIN USER PASSWORD

- If you need a proxy to connect to the Internet, set the proxy settings accordingly:

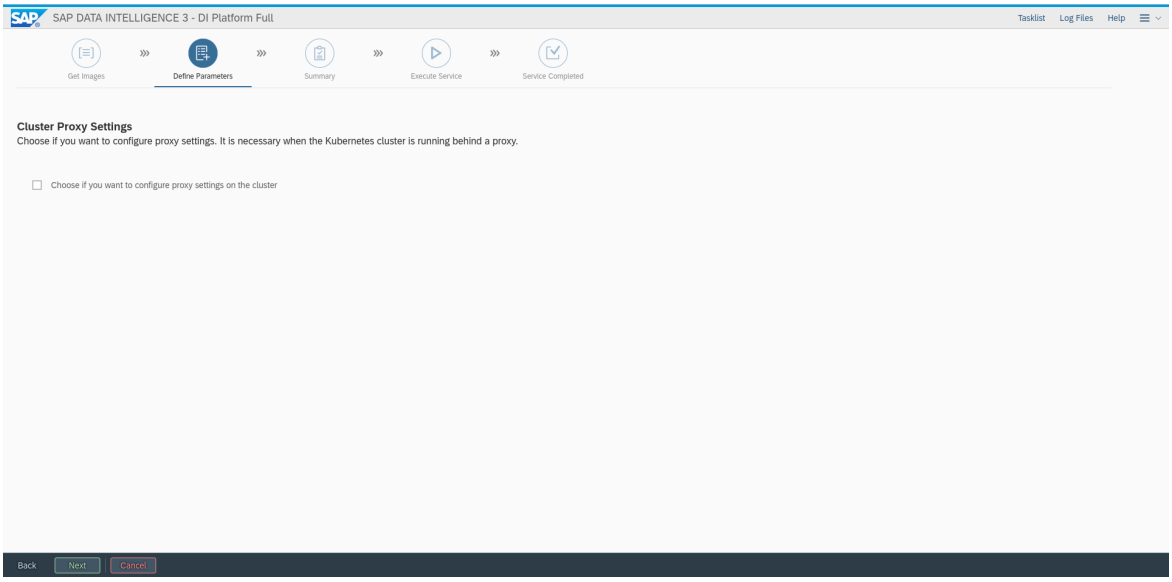



FIGURE 30: INSTALLATION PROXY SETTINGS

- Select if you want to use a checkpoint storage:

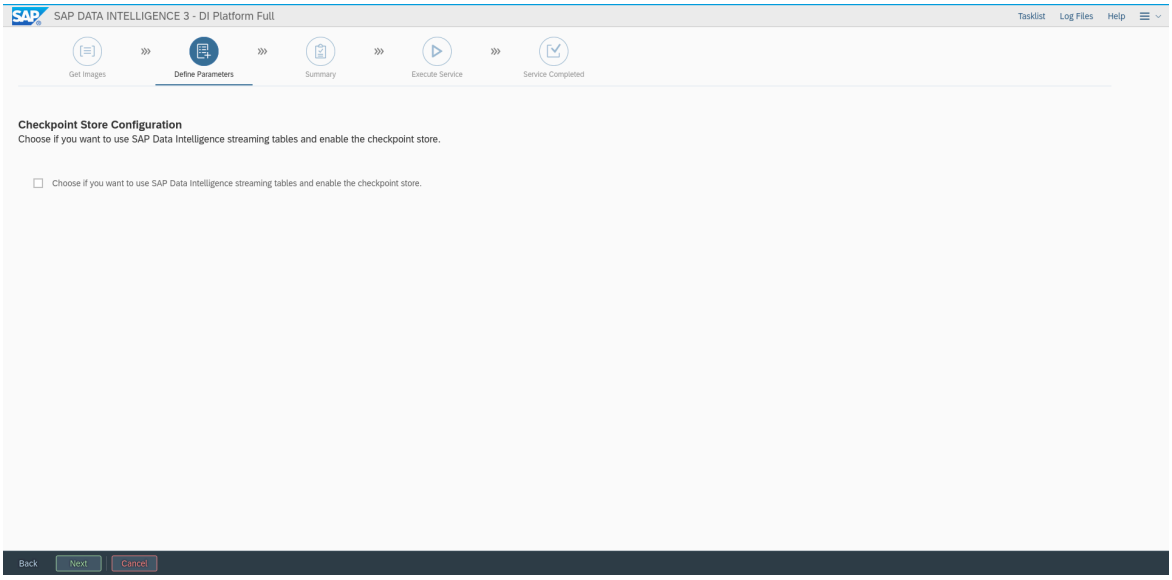



FIGURE 31: INSTALLATION CONFIGURE CHECKPOINT STORAGE

- Define the storage class that should be used by SAP DI 3.0. Enter the name of the storage class you created previously:

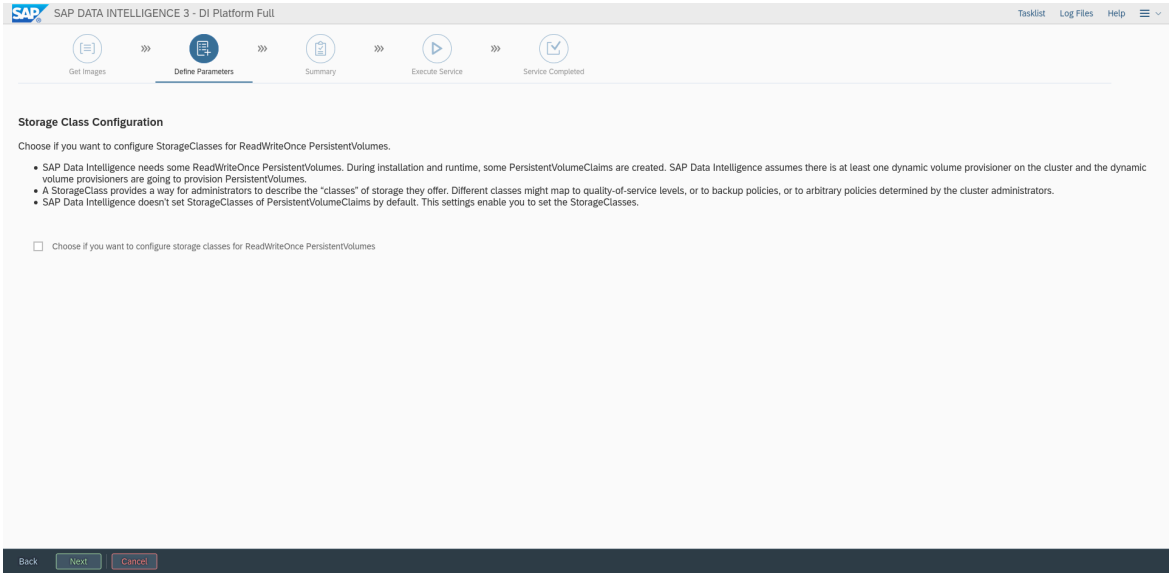



FIGURE 32: INSTALLATION DEFINE STORAGE CLASS TO BE USED

- For the SAP DI 3 installation on SUSE CaaSP 4.2 the docker log path needs to be adapted. Check the check box and click "Next":

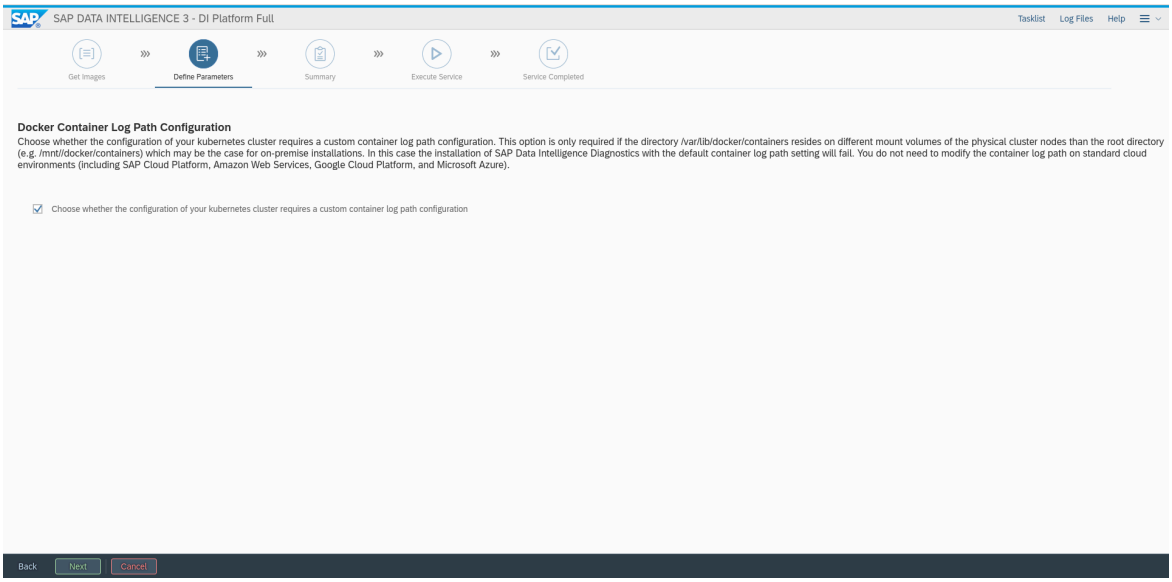



FIGURE 33: INSTALLATION DOCKER LOG PATH

- Enter the docker log path: "/var/log/containers"

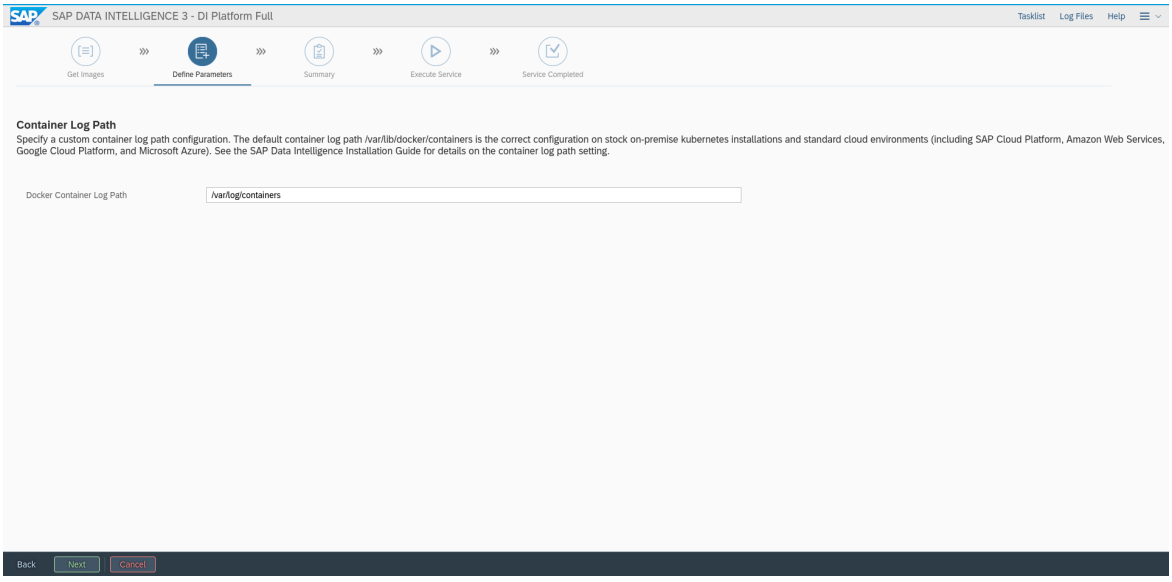



FIGURE 34: INSTALLATION DOCKER LOG PATH

- Enable Kaniko:

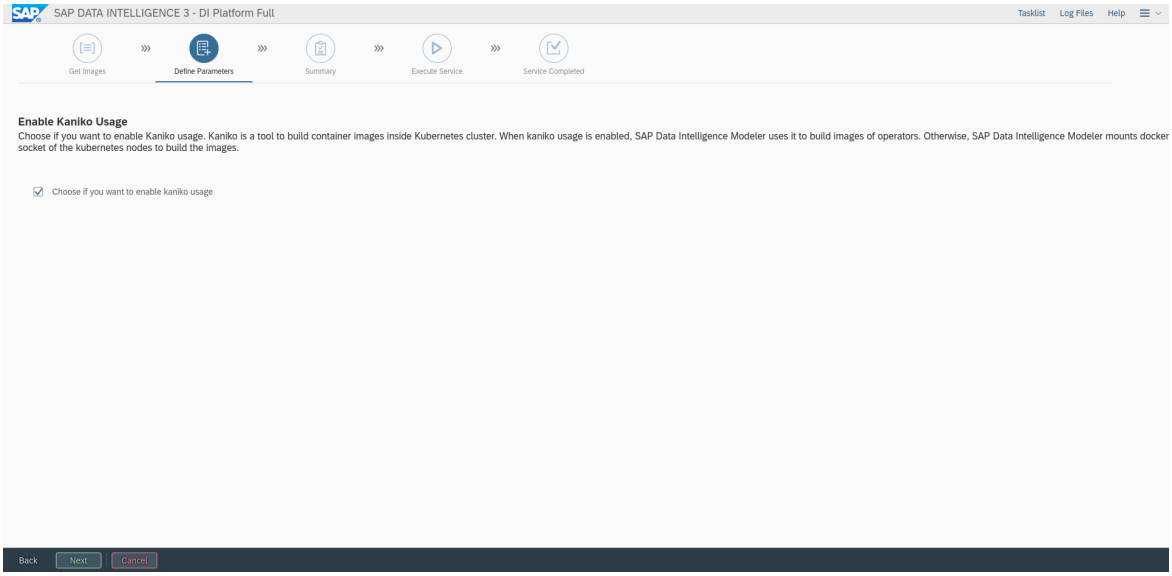



FIGURE 35: INSTALLATION ENABLE USAGE OF KANIKO

- Here, a different private registry can be configured if needed. To proceed, click "Next":

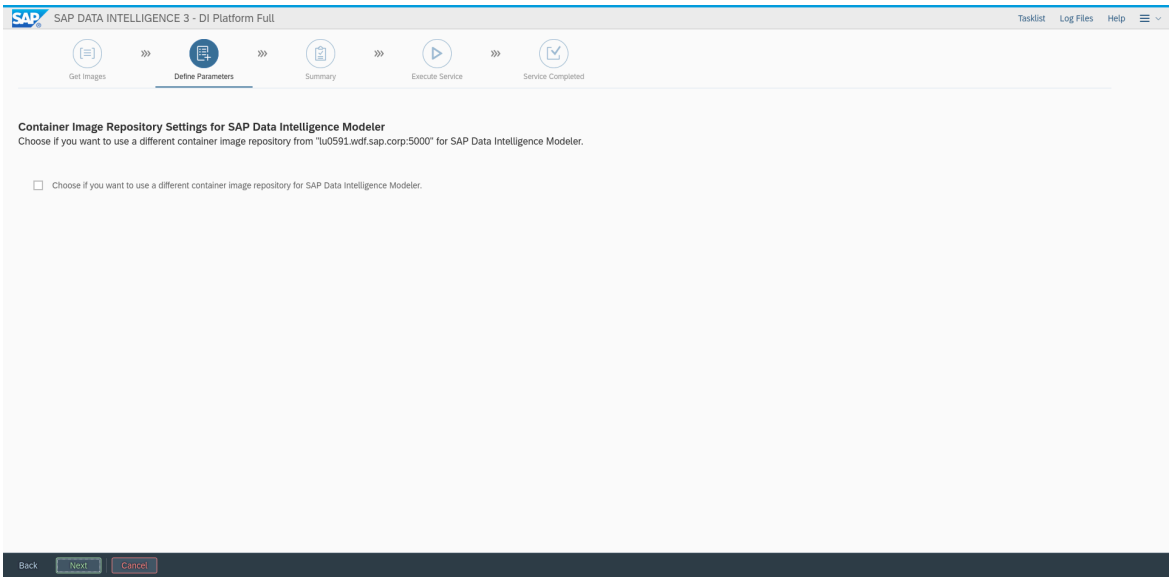



FIGURE 36: INSTALLATION DOCKER REGISTRY FOR SAP DI MODELER IMAGES

- Enable the loading of NFS kernel modules. This ensures that the NFS kernel modules are loaded on all Kubernetes nodes. Check the check box and click "Next":

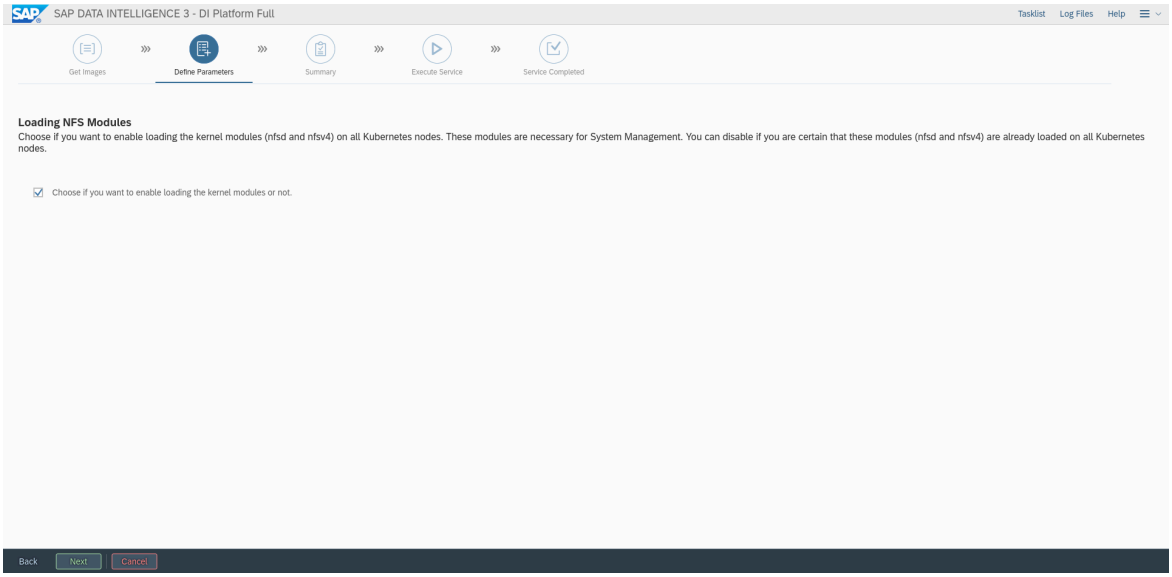



FIGURE 37: INSTALLATION LOAD NFS KERNEL MODULES

- If needed, enable Network policies. Click "Next":

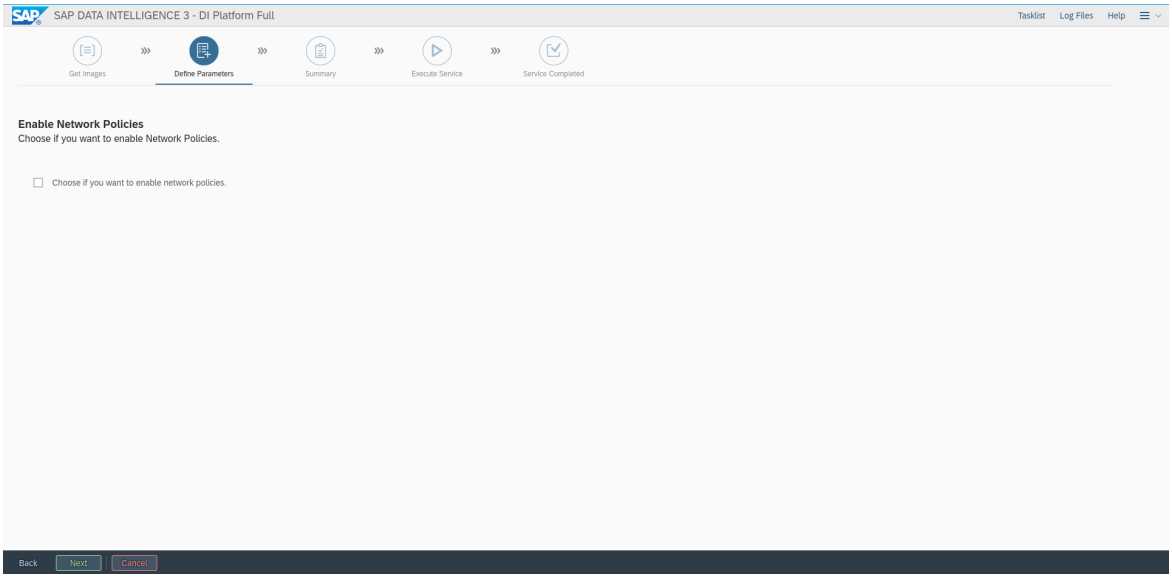



FIGURE 38: INSTALLATION ENABLE NETWORK POLICIES

- Configure timeout during installation, leave the default and click "Next":

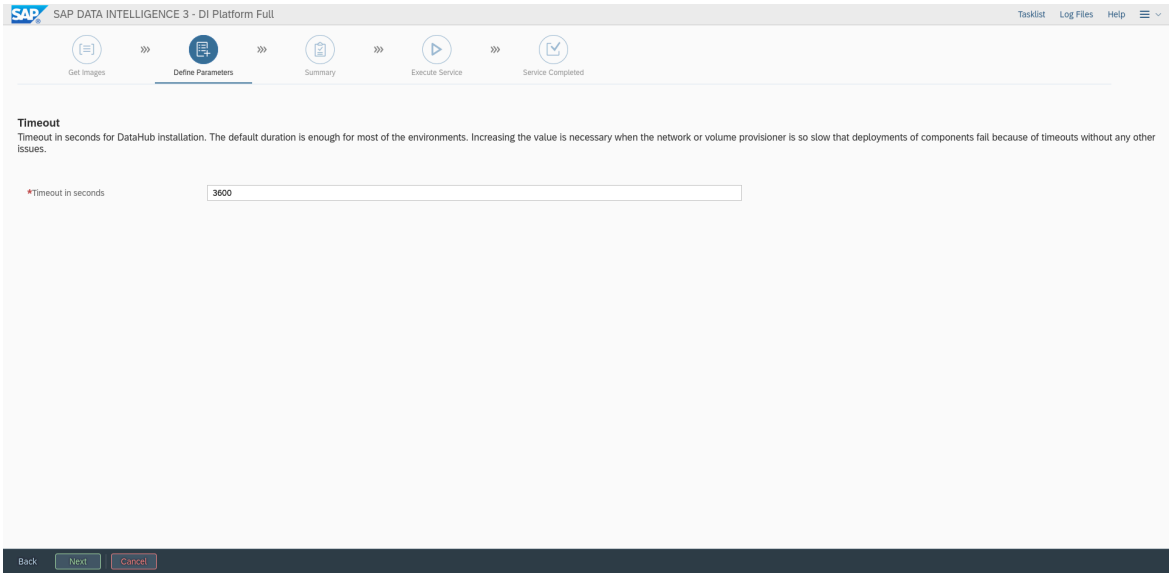



FIGURE 39: INSTALLATION CONFIGURE TIMEOUT DURING INSTALLATION OF SAP DI 3

- In the field "Additional Installation Parameters", enter: `-e diagnostic.fluentd.logDriverFormat=regexp -e vsystem.vRep.exportsMask=true`

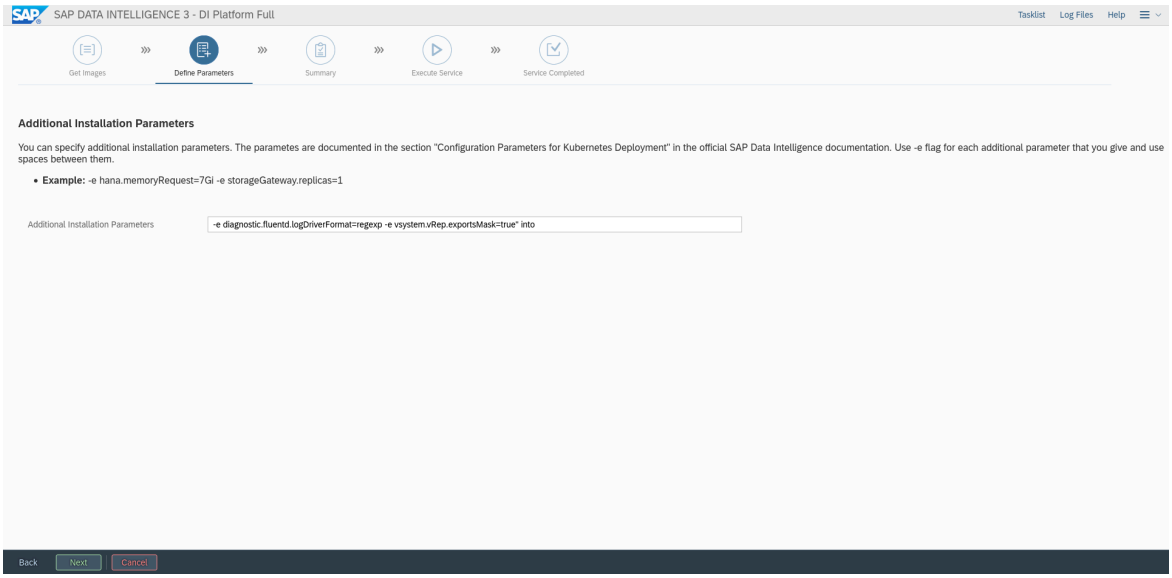



FIGURE 40: INSTALLATION ADDITIONAL INSTALLATION PARAMETERS

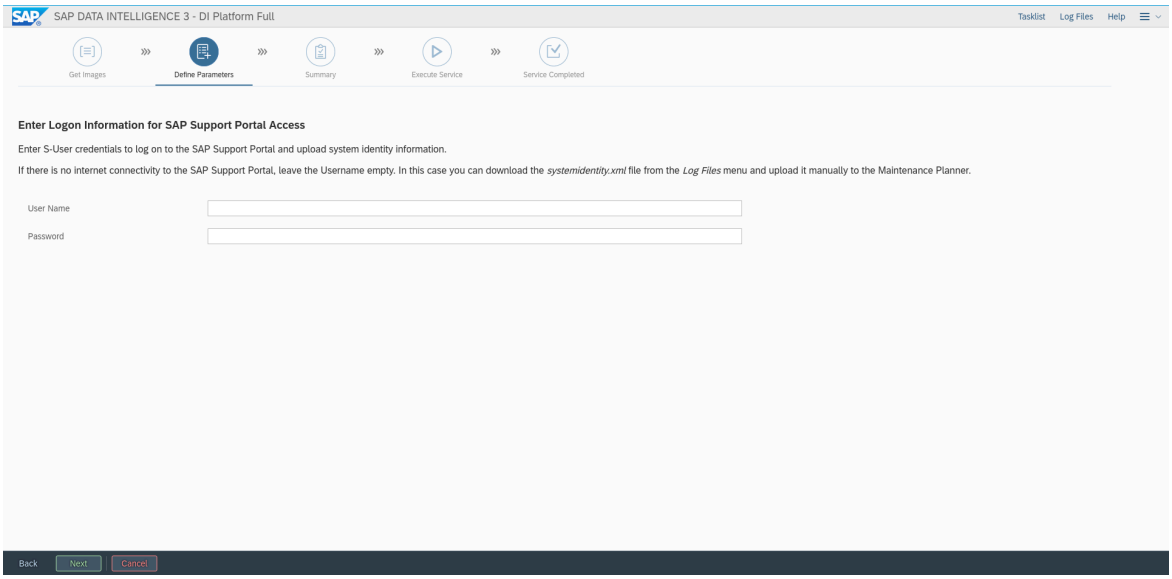



FIGURE 41: INSTALLATION #24

- Check the Summary page. Check if the settings are correct:

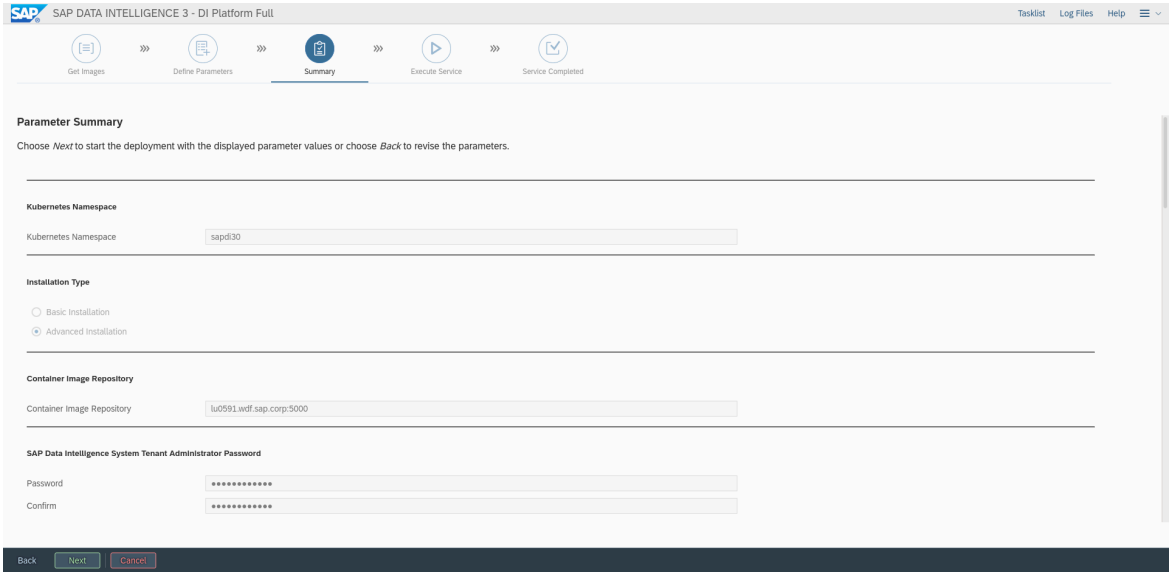



FIGURE 42: SUMMARY OF INSTALLATION PARAMETERS

- Click "Next" to start the deployment of SAP DI 3.0.

Your installation should now be finished.

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