Arm: Deploying SUSE Linux Enterprise Server Using Network PXE Boot

SUSE Linux Enterprise Server network PXE boot enables remote, automated operating system deployment across target Arm devices over a local area network. By loading the kernel, **`initrd`** and Agama installer directly from network infrastructure, administrators can efficiently provision standard or immutable system configurations at scale without physical media, reducing deployment time and ensuring consistent baseline installations.

Prerequisites

- A properly configured DHCP server.
- A properly configured PXE boot server. For details, refer to: PXE server installation (https://documentation.suse.com/sles/16.1/html/SLES-PXE-server).

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1 Booting the machine

To begin the remote installation of SLES, boot the target system over the network to load the installer environment. Follow these steps to initiate the network boot sequence and launch Agama.

The following procedure describes how to boot the client machine to start the remote deployment of SLES using the PXE client.

1. Power on the target machine or create a virtual machine. Make sure to use bridged networking.
2. Enter the boot menu and select booting using PXE or HTTP. Continue to boot the machine.
3. The machine should start the deployment. Kernel and `initrd` are downloaded from the PXE boot server. Boot loader is started.
4. In the GRUB 2 menu, select the installation target. You can pass kernel boot parameters if needed.
5. `initrd` configures the network and starts the SUSE Linux Enterprise Server deployment using Agama.

2 Selecting a product and installation mode

In this step, you select the product and its installation mode.

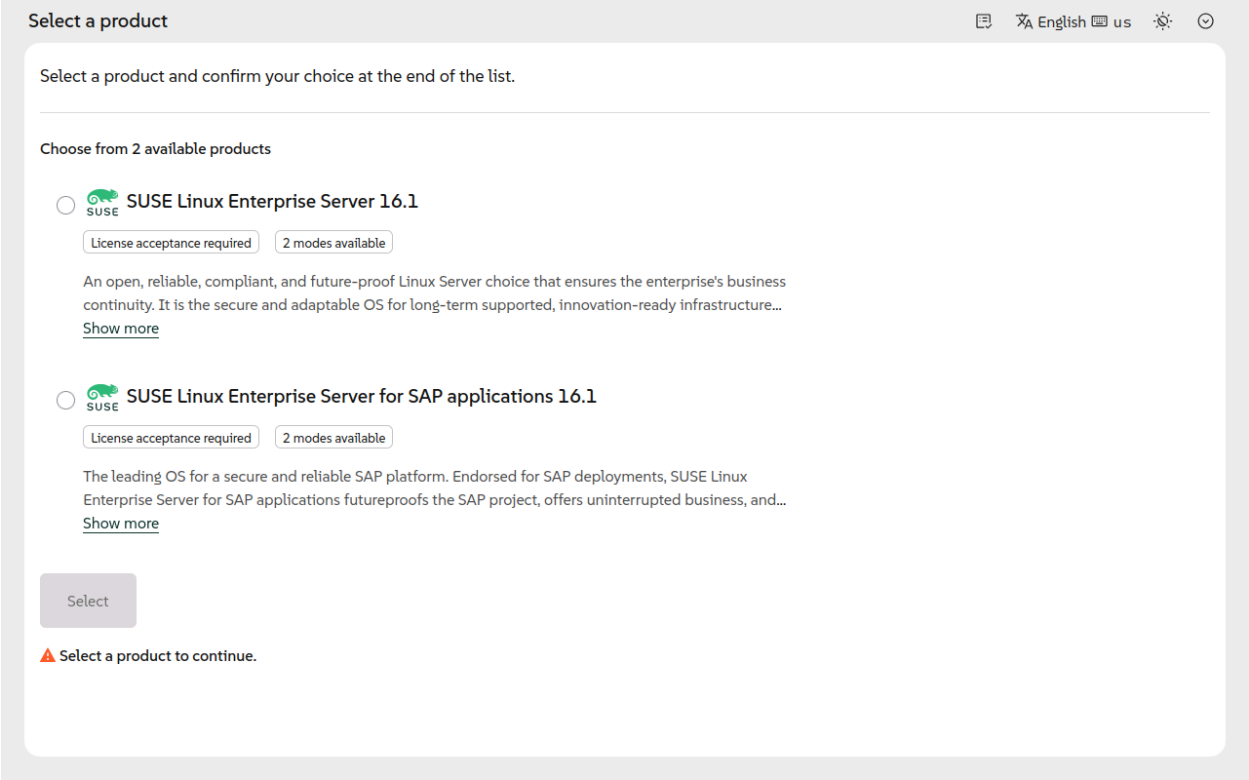


FIGURE 1: AGAMA INSTALLER PRODUCT SELECTION

Select SUSE Linux Enterprise Server 16.1 for installation and choose its installation mode:

INSTALLATION MODES

Standard

The file system is writable. This mode offers maximum flexibility.

Immutable

The root file system is write-protected. Updates are applied atomically to a new snapshot. The snapshot becomes active after a reboot.

Read and accept the license to continue.



Tip: Additional installer features

At the top right of the installer, there is a tool bar with icons to access additional installer features:

ICONS (FROM LEFT TO RIGHT)

Status icon

Shows the status of the installer. `Idle` means the installer is waiting for input.

Language and keyboard icons

Allows changing the language and keyboard layout of the installer. This affects only the installer interface, not the product to be installed. You can adjust the localization of the product later in *Section 6, "Setting language and region"*.

Appearance icon

Allows changing the color scheme and contrast of the installer.

More

Allows downloading the configuration in the JSON format and the installation logs.

3 Reviewing the installation overview

The installation overview shows the most relevant settings. Each category displays a summary of its settings. Categories with invalid settings are marked. Configure them before you start the installation.

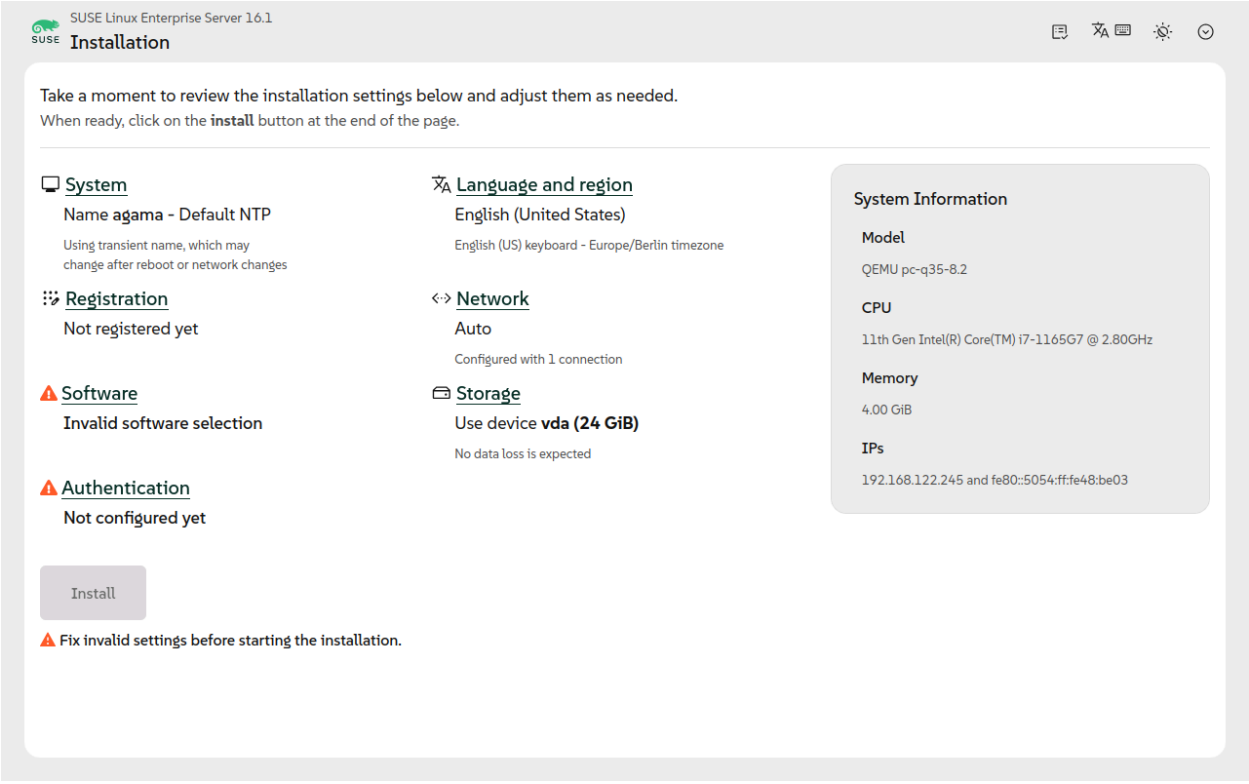


FIGURE 2: AGAMA INSTALLER SETTINGS OVERVIEW

Select a category to adjust its settings.

There is no particular order for the configuration, but it is recommended to start with the *System* settings and continue with the *Registration*. Categories with pending or invalid settings must be resolved before proceeding with the installation.

4 Registering the system

Register the product in the *Registration* screen.

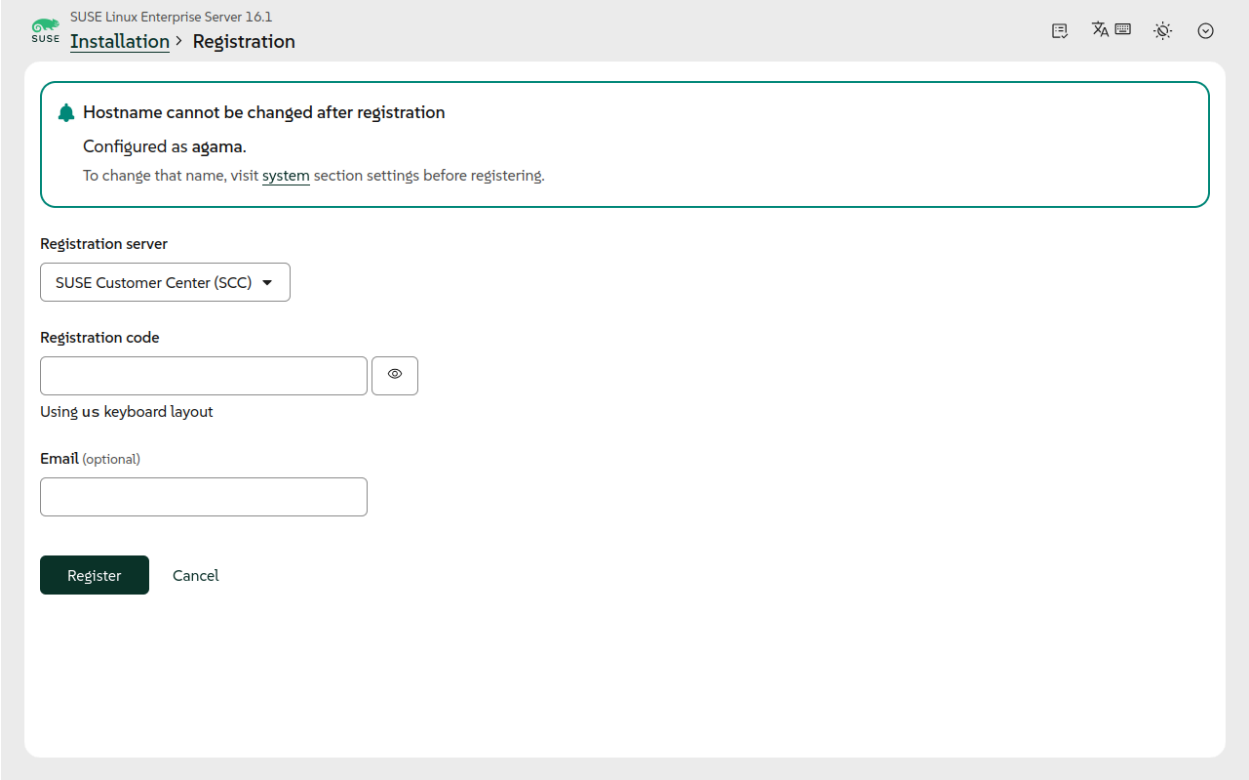


FIGURE 3: AGAMA INSTALLER REGISTRATION SETTINGS

Choose a registration server and enter the details:

REGISTRATION SETTINGS

Registration server

SUSE Customer Center (SCC)

Register with the SUSE Customer Center. If your system is behind a firewall, make sure https://scc.suse.com/ is reachable from your network.

Custom

Register with your own SUSE Multi-Linux Manager or RMT infrastructure and provide the *Server URL*. Use this option for air-gapped environments.

Registration code

Enter a valid registration code for SUSE Linux Enterprise Server. The code is hidden by default but can be shown by clicking on the eye icon.

Email (optional)

Optionally, enter a valid e-mail address. For organizations, we recommend using the address assigned to the registration code.

Click *Register* to register the system.

4.1 Registering extensions

After successfully registering the base system, you can register additional extensions. The following extensions are available for SUSE Linux Enterprise Server 16.1:

EXTENSIONS FOR THE SUSE LINUX ENTERPRISE SERVER 16.1 FAMILY

SUSE Linux Enterprise High Availability Extension 16.1

The SUSE Linux Enterprise High Availability extension provides mature, industry-leading open source high-availability clustering technologies that are easy to set up and use. You can deploy it in physical environments, virtual environments or both. It clusters physical servers, virtual servers or any combination of the two to suit the needs of your business.

To register your SUSE Linux Enterprise High Availability extension, enter its registration code and click *Register*.

SUSE Package Hub 16.1

SUSE Package Hub is a free module providing access to community-maintained packages built to run on SUSE Linux Enterprise Server. Built from the same sources used in openSUSE distributions, these quality packages provide additional software to what is found in SUSE Linux Enterprise Server. The packages in this module are delivered without L3 support but do not interfere with the supportability of SUSE Linux Enterprise Server.

To register with the SUSE Package Hub, click *Register*. When the installer asks whether to trust the signing key of the SUSE Package Hub repository, click *Trust*.

5 Configuring the system

In the *System* screen, configure the host name and the time synchronization servers.

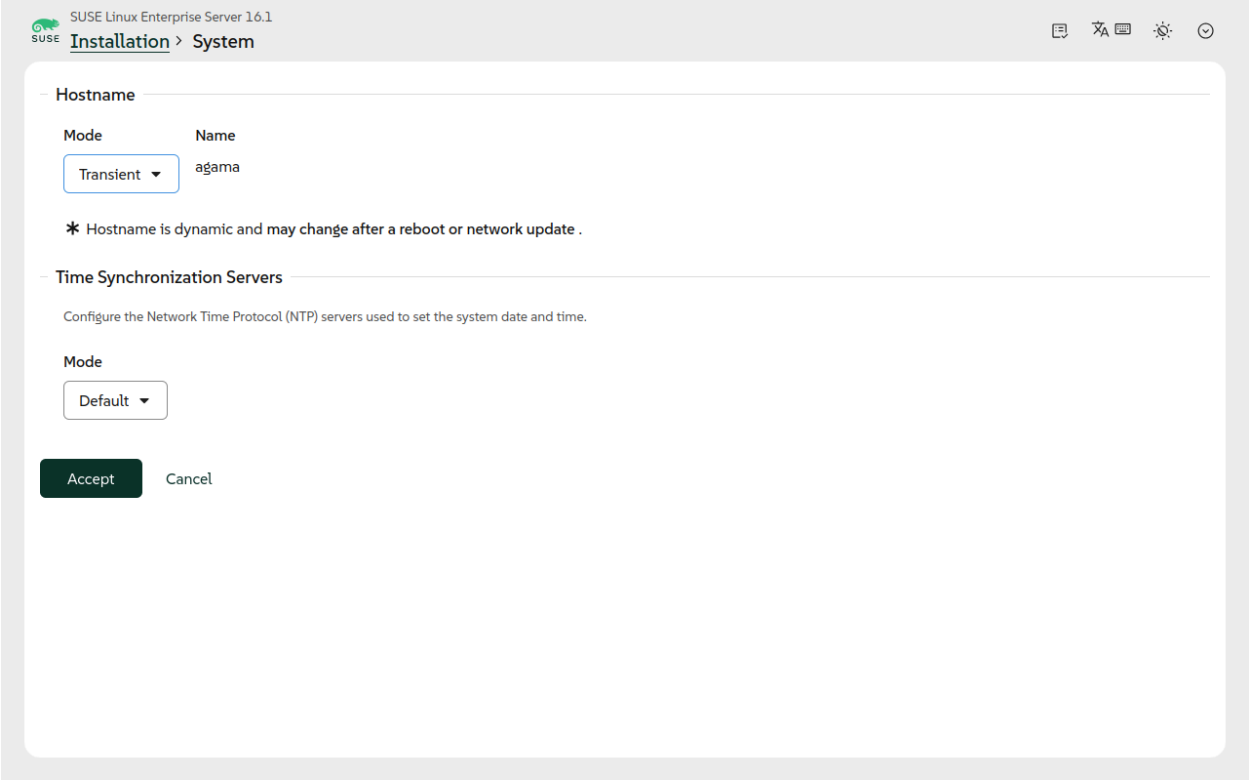


FIGURE 4: AGAMA INSTALLER SYSTEM SETTINGS

5.1 Setting the host name

Set the host name of the system in one of the following modes.

HOST NAME SETTING MODES

Transient (default)

The host name is assigned with DHCP and may change after a reboot or network change. The transient host name `agama` is used for the installation.

Static

Set a static host name. You can either use a fully qualified domain name (FQDN) or the host name part only.



Important: Host name for the registration

The host name is used for the registration with the SUSE Customer Center. If you do not set a host name, your system will be registered with the transient host name `agama`. Even if the system is assigned a new host name later, it will not automatically get updated in the SUSE Customer Center. Therefore setting host name is recommended.

To update the host name in the SUSE Customer Center after registration, first change the system's host name. Then use **`SUSEConnect`** to deregister the system and register it again under the new host name.



Tip: Identifying systems in the SUSE Customer Center

If you have multiple systems registered with the same host name in the SUSE Customer Center, it is difficult to tell them apart. To identify a system, use its UUID. You can find it under *Hardware information* in the SUSE Customer Center and on the system by running **`dmidecode -s system-uuid`**.

5.2 Setting time synchronization servers

The system time is set with the Network Time Protocol (NTP) to ensure the system time is always correct. Choose one of the following modes:

TIME SYNCHRONIZATION MODES

Default

The system uses one of the default SUSE NTP servers `1.suse.pool.ntp.org` to `3.suse.pool.ntp.org`. If your system is behind a firewall, make sure that these servers are reachable from your network.

Custom

In the custom mode, you can configure the NTP servers to use. Use this option for air-gapped environments. Specify servers by host name, IP address or FQDN. Separate multiple entries with colons.

Click *Accept* to save your changes.

6 Setting language and region

Adjust the localization settings, such as language, keyboard layout and time zone, in the *Language and region* screen.

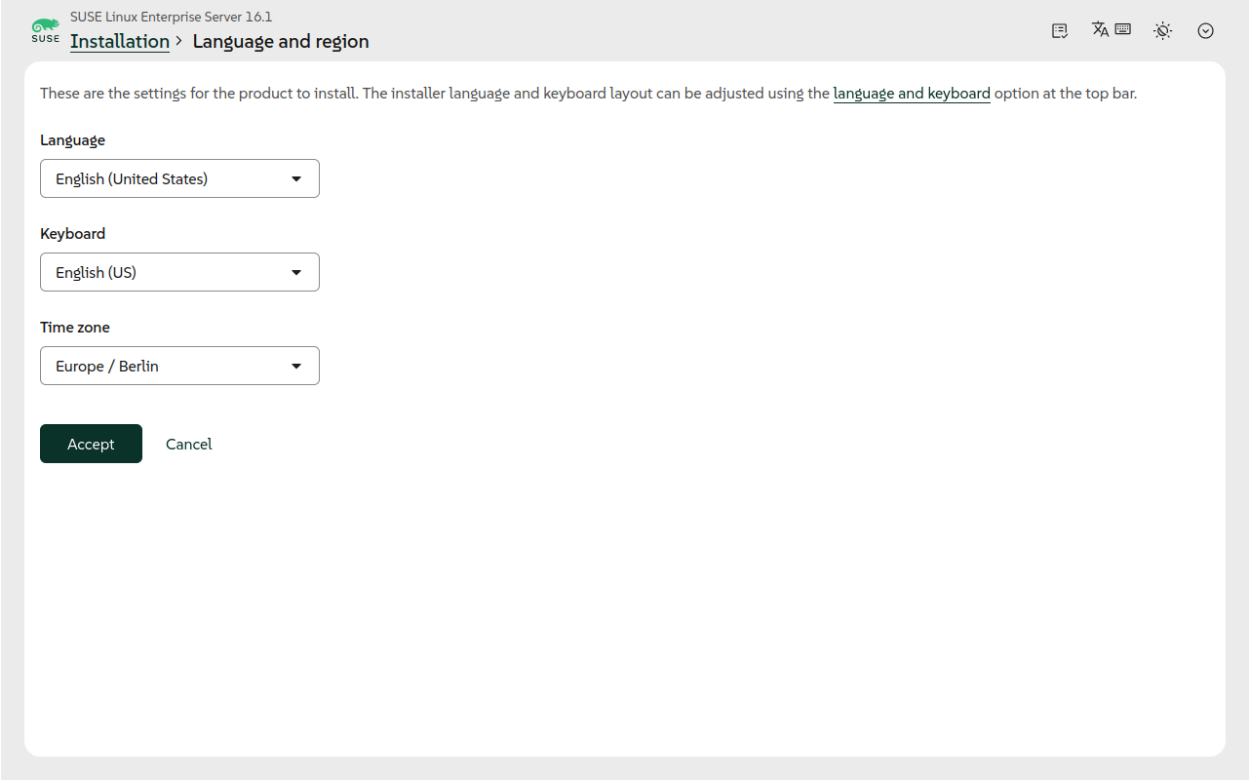


FIGURE 5: AGAMA INSTALLER LOCALIZATION SETTINGS

LANGUAGE AND REGION SETTINGS

Language

The language used for the system. It can be different from the language used during installation. Default value: `English (United States)`.

Keyboard

The keyboard used for the system. It can be different from the keyboard used during installation. Default value: `English (US)`.

Time Zone

The time zone of the system. The default value is determined automatically based on your network location.

Click *Accept* to save your changes.

7 Configuring the network

Manage network connections in the *Network* screen.

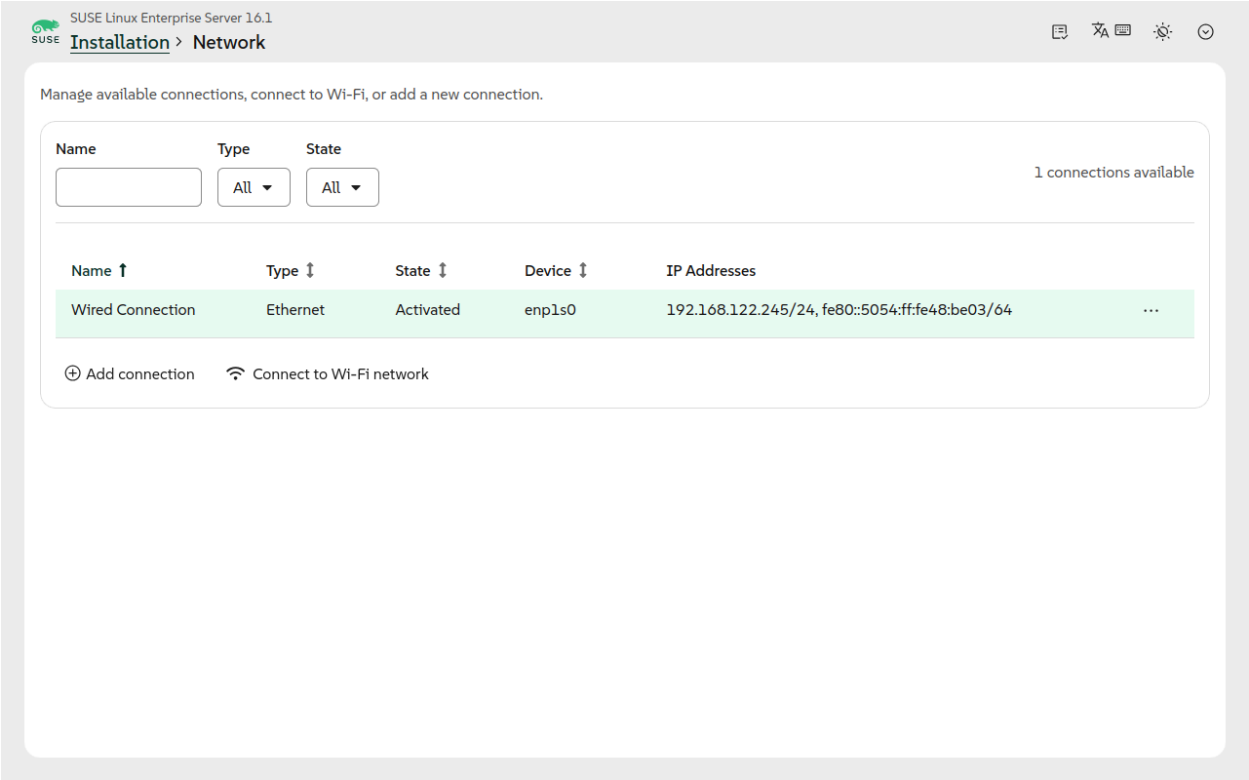


FIGURE 6: AGAMA INSTALLER NETWORK SETTINGS

The overview shows the configured network connections in a table. Click the headers to sort the connections by name, type, state, device, or IP address. You can also filter by name (with wildcards), type and state.

7.1 Editing a connection

By default, Agama configures a connection with DHCP. To edit a connection, click the three dots at the end or the line. The following options are available:

Details

Shows the connection details, both the current status and the configuration.

Edit connection

Edits the connection. For details, refer to *Section 7.2, "Adding a new connection"*.

Disconnect

Temporarily disconnects the connection.

Delete

Deletes the connection and frees the device for a different connection.

7.2 Adding a new connection

Click *Add connection* to configure a new network connection. The following types are supported:

Ethernet

ETHERNET SETTINGS

Name

Name of the connection. Meaningful names can use the destination (`Internet`), the connection type (`Ethernet`) or the device (`eth0`, if device binding is enabled). Free text, but it is recommended to avoid special characters.

Device Binding

None

The connection is available for all devices. After a reboot or relocatation the system, the device may change.

Chosen by name

The connection is identified by its name in the system.

Chosen by MAC

The connection is identified by its physical address.

One of *None*

IPv4 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv4 address such as `192.168.1.1.` or `192.168.1.1/24` The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

IPv6 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv6 address such as *`2001:db8::1`* or *`2001:db8::1/64`*. The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

Use custom DNS servers

Enable and specify the addresses of the DNS servers.

Use custom DNS search domains

Enable and specify the DNS search domain such as *`example.com`*.

Bonding

BONDING SETTINGS

Name

Name of the connection. Meaningful names can use the destination (*`Internet`*), the connection type (*`Bond`*) or the device (*`bond0`*, if device binding is enabled). Free text, but for practical reasons it is recommended to avoid special characters.

Device name

Provide a device name such as *`bond0`*.

Bond mode

Select the bonding mode:

balance-rr

Packets are transmitted in round-robin fashion from the first to the last available interface. Provides fault tolerance and load balancing. Requires switch support. Certain switches might fail with this mode.

active backup

Only one network interface is active. If it fails, a different interface becomes active. Provides fault tolerance. No specific switch support is required.

balance-xor

Traffic is split between all available interfaces based on the number of interfaces included in the bonded device. Provides fault tolerance and load balancing. Requires switch support. Certain switches might fail with this mode.

broadcast

All traffic is broadcast on all interfaces. Provides fault tolerance. Requires switch support. Certain switches might fail with this mode.

802.3ad

Also called LACP. All interfaces in the LACP group must share the same speed and duplex settings, and must be connected to the same switch. Provides fault tolerance and load balancing. Requires **`ethtool`** support in the interface drivers, and a switch that supports and is configured for IEEE 802.3ad Dynamic link aggregation. If your switch supports it, this is the preferred mode.

balance-tlb

Adaptive transmit load balancing. Provides fault tolerance and load balancing. Requires **`ethtool`** support in the interface drivers. No specific switch support is required, but certain switches might fail with this mode.

balance-alb

Adaptive load balancing. Provides fault tolerance and load balancing. Requires **`ethtool`** support in the interface drivers. No specific switch support is required, but certain switches might fail with this mode.

IPv4 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv4 address such as *`192.168.1.1.`* or *`192.168.1.1/24`* The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

IPv6 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv6 address such as *2001:db8::1* or *2001:db8::1/64*. The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

Bridge

BRIDGE SETTINGS

Name

Name of the connection. Meaningful names can use the destination (*Internet*), the connection type (*Bridge*) or the device (*br0*, if device binding is enabled). Free text, but it is recommended to avoid special characters.

Device name

Name of the device, such as *br0*

Spanning Tree Protocol (STP)

Default

(Enabled with the system default settings)

Custom

Custom (Explicitly enabled with manual settings): Forward delay (optional)

Disabled

(not used by this bridge)

IPv4 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv4 address such as *192.168.1.1.* or *192.168.1.1/24* The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

IPv6 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv6 address such as *`2001:db8::1`* or *`2001:db8::1/64`*. The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

VLAN

VLAN SETTINGS

Name

Name of the connection. Meaningful names can use the destination (*`Internet`*), the connection type (*`VLAN`*) or the device (*`eth0`*, if device binding is enabled). Free text, but it is recommended to avoid special characters.

Device Binding

One of *None*

IPv4 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv4 address such as *`192.168.1.1.`* or *`192.168.1.1/24`* The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

IPv6 settings

Automatic

IP address and gateway are assigned from the network with DHCP.

Manual

Static IP address, netmask and gateway. Enter an IPv6 address such as *`2001:db8::1`* or *`2001:db8::1/64`*. The prefix is added automatically if omitted.

Automatic + Manual

DHCP configuration from the network plus static addresses and gateway.

8 Selecting software

Add additional software to install, such as the KVM hypervisor or the Cockpit system management service.

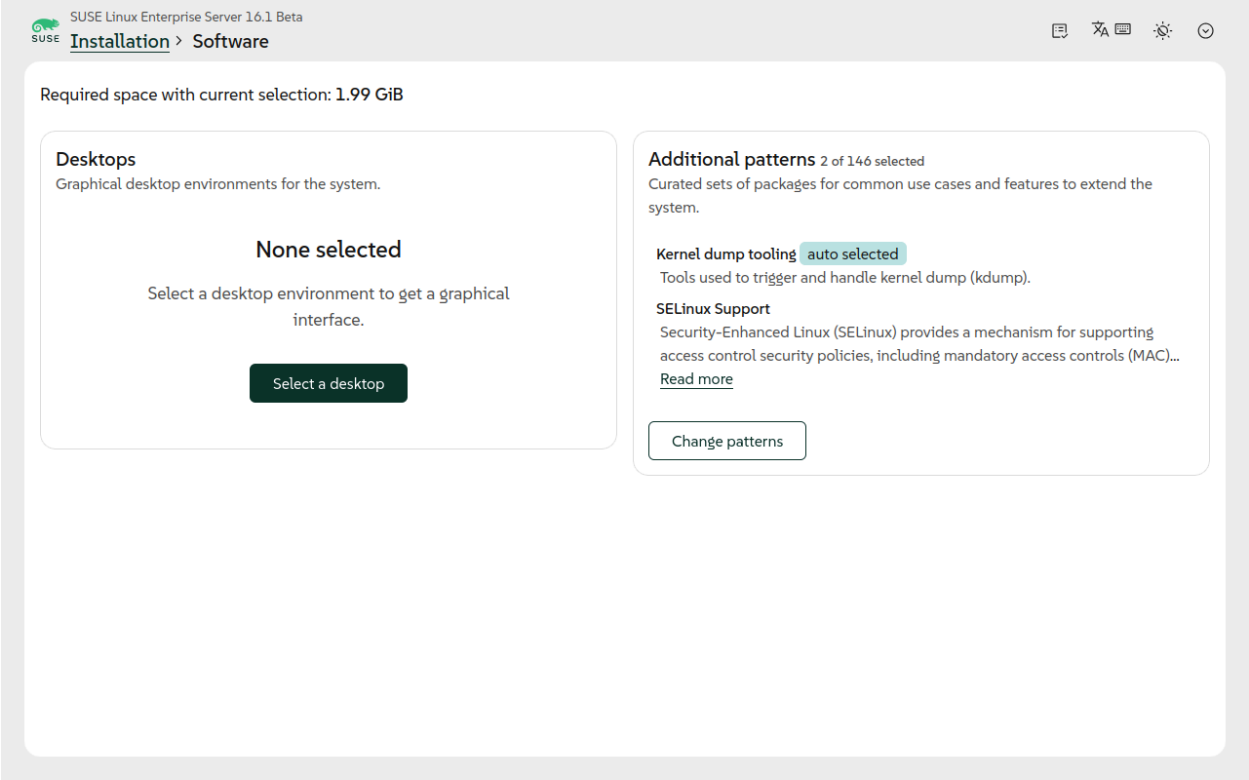


FIGURE 7: AGAMA INSTALLER SOFTWARE SELECTION

Note: Trust the GPG key for the Package Hub repository

If you select the Package Hub add-on and see a popup, trust the GPG key for that repository.

8.1 Selecting a desktop

Select a desktop environment to get a graphical interface. SUSE Linux Enterprise Server ships with the GNOME desktop.

8.2 Selecting additional software patterns

Patterns are curated sets of packages for common use cases and features to extend the system. The default installation includes `Kernel dump tooling` and `SELinux support`. To remove them or install additional patterns, click *Change patterns*.

9 Configuring storage

Select a storage device for the installation in the *Storage* screen.

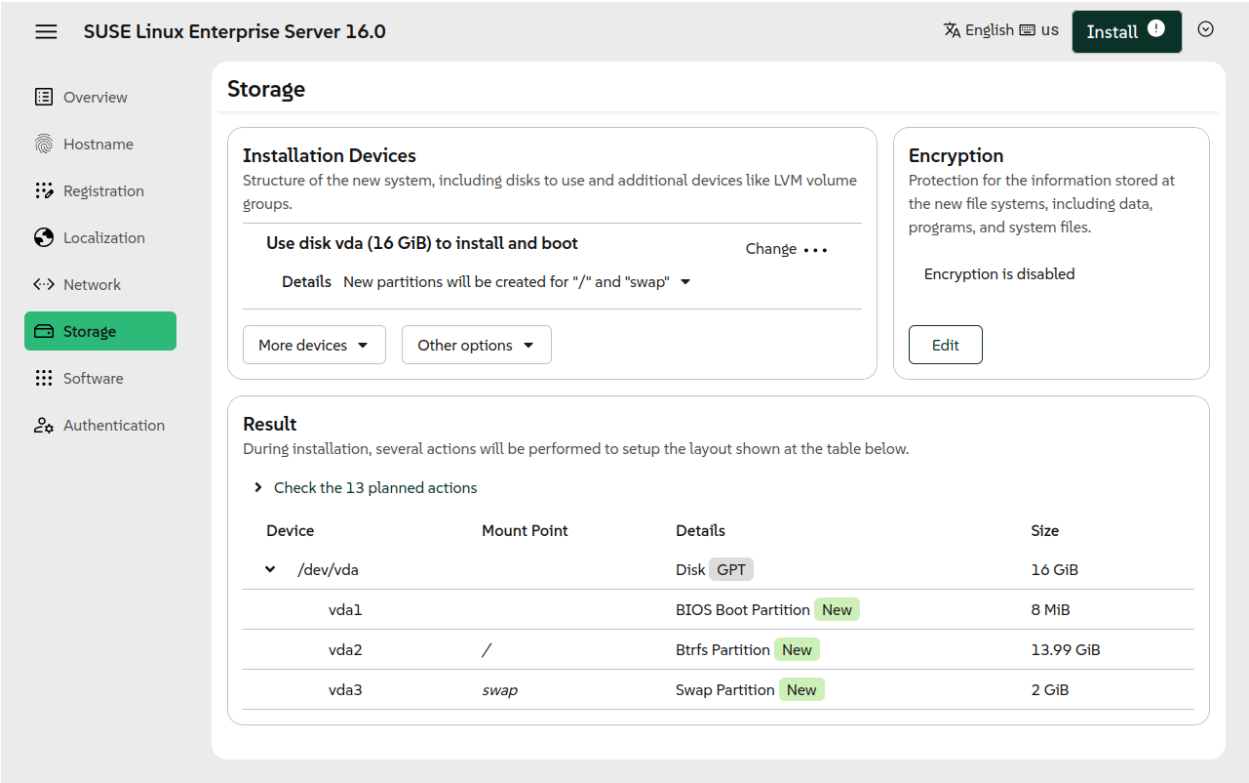


FIGURE 8: AGAMA INSTALLER STORAGE CONFIGURATION

Currently installations on single discs or LVM are supported. To change the disk or use LVM, click the device name *More options* button in the *Installation devices* section.

To detect an iSCSI disk, select the iSCSI initiator and click *Discover iSCSI targets*.

By default, the file systems are allocated as new partitions on the selected device. You can change this behavior in the drop-down list labeled *All content will be deleted* in the *Installation devices* section. The following space policies are available:

SPACE POLICIES

Delete current content

All partitions are removed, and any data on the disks is lost.

Shrink existing partitions

The data is kept, but Agama shrinks the current partitions as needed.

Use available space

The data is kept. Only the space not assigned to any partition is used.

Custom

Select what to do with each partition.

Important: RAID support

The current Agama user interface does not expose all the options supported by Agama's storage configuration. Complex configurations such as RAID can be applied through Agama profiles. For more information, refer to the article *Automated Installation Using Agama* (https://documentation.suse.com/sles/16.1/html/SLES-x86-64-agama-automated-installation/index.html#agama-advanced-storage-configuration).

If the selected storage already has a RAID configuration —either from a previous installation or created by an Agama profile—the RAID devices can be used for installation. In this case, you may see a message like `Use RAID 0 (60.00 GiB) to host LVM` in the user interface. Please note in this context, the term `RAID 0` refers to the RAID device (`/dev/md/0`), not the RAID level.

To edit individual partitions, expand the *Partitions and file systems* section by clicking >. Optionally, you can configure Btrfs snapshots, boot options and enable full disk encryption (FDE).

10 Configuring authentication

Before you continue, create an administrator account or configure authentication for the `root` user.

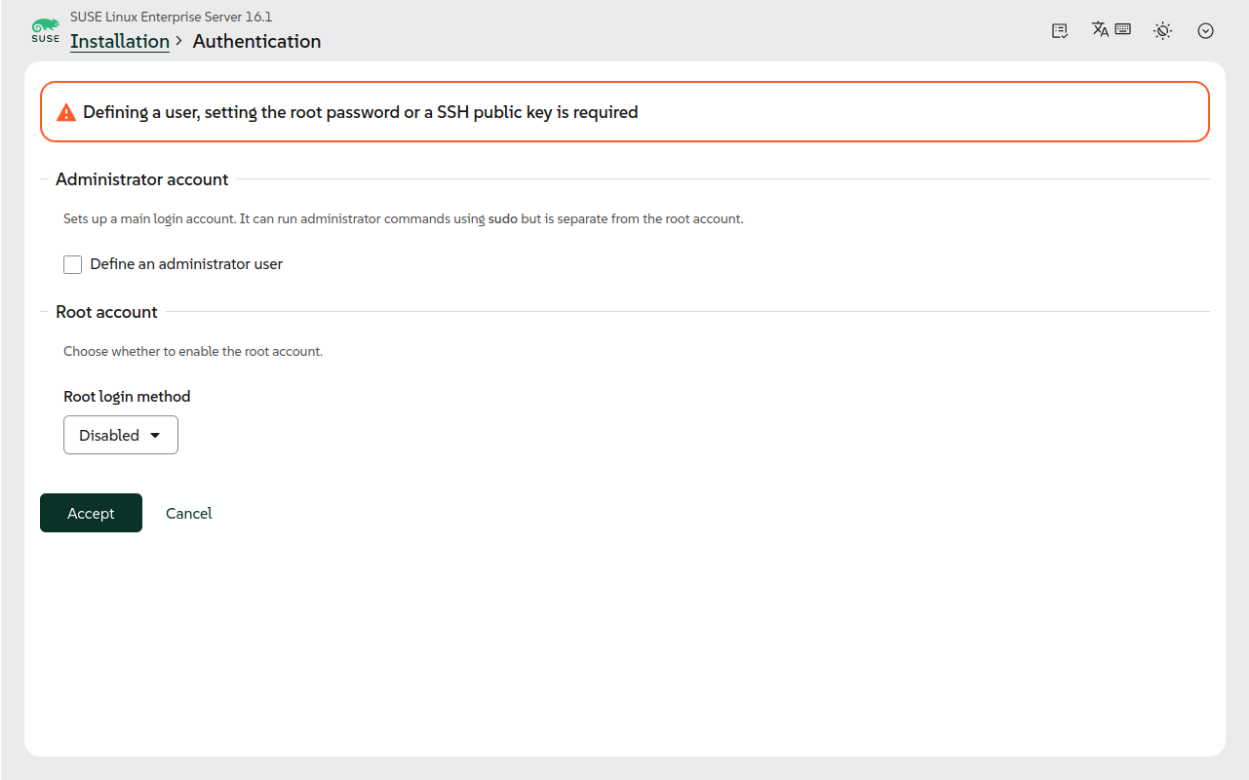


FIGURE 9: AGAMA INSTALLER AUTHENTICATION SETTINGS

Before you can continue with the installation, you need to create an administrator account or configure the authentication for the `root` user.

10.1 Creating an administrator account

To improve security, `root` login is disabled in SUSE Linux Enterprise Server by default. Instead, an administrator user is used as main login account. This administrator can run administrative commands with **`sudo`**.

To create an administrator account, tick the checkbox *Define an administrator user* and enter the necessary user details.

ADMINISTRATOR USER SETTINGS

Full name

Full name of the administrator user.

Username

A user name. Only use lowercase letters (a-z), digits (0-9) and the characters `.` (dot), `-` (hyphen) and `_` (underscore). Avoid other special characters and accented characters.

SSH Public Key (optional)

Paste one or more public SSH keys to enable passwordless login with SSH. To add a key, press `Enter` or `→|` . To remove a key, press `<-` or `Del` . To navigate between keys, use the `↑` and `↓` arrows.



Important: No SSH `root` access

SSH access for `root` is disabled by default. Therefore it is strongly recommended to create a system user. The first system user is granted **`sudo`** privileges automatically and can also be used for accessing Cockpit.

10.2 Configuring the `root` user

Configure the authentication methods for the `root`. You can use a secure password, an SSH public key or both.

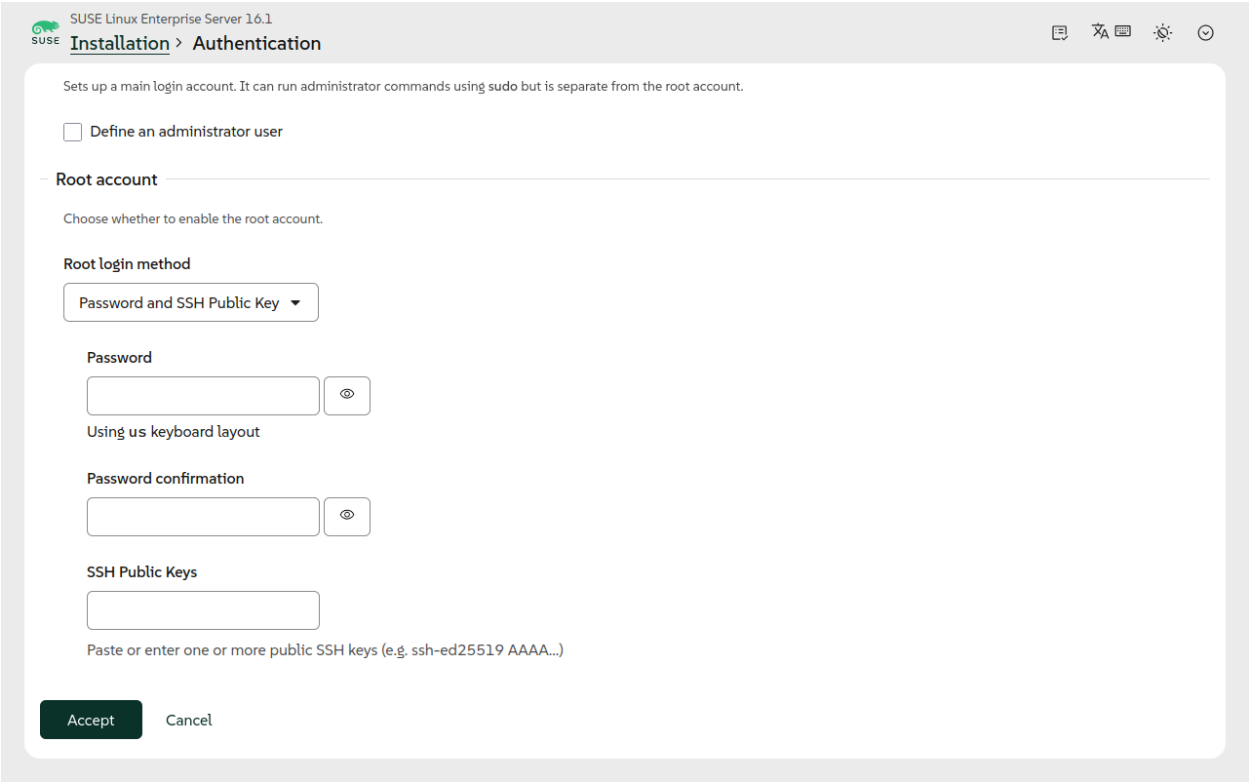


FIGURE 10: AGAMA INSTALLER `root` AUTHENTICATION CONFIGURATION

ROOT LOGIN METHOD

Disabled

The `root` login is disabled and the administrator uses **`sudo`** for all administrative tasks.

Password

The `root` can log in with a password. Configure a strong password.

SSH Public Key

The `root` can log in with an SSH public key. Paste one or more public SSH keys. To add a key, press **`Enter`** or **`→|`**. To remove a key, press **`<-`** or **`Del`**. To navigate between different keys, use the **`↑`** and **`↓`** arrows.

Password and SSH Public Key

The `root` user can log in both with a password and SSH key(s). Configure both as described above.

11 Starting the installation

Review the configuration in the installation overview.

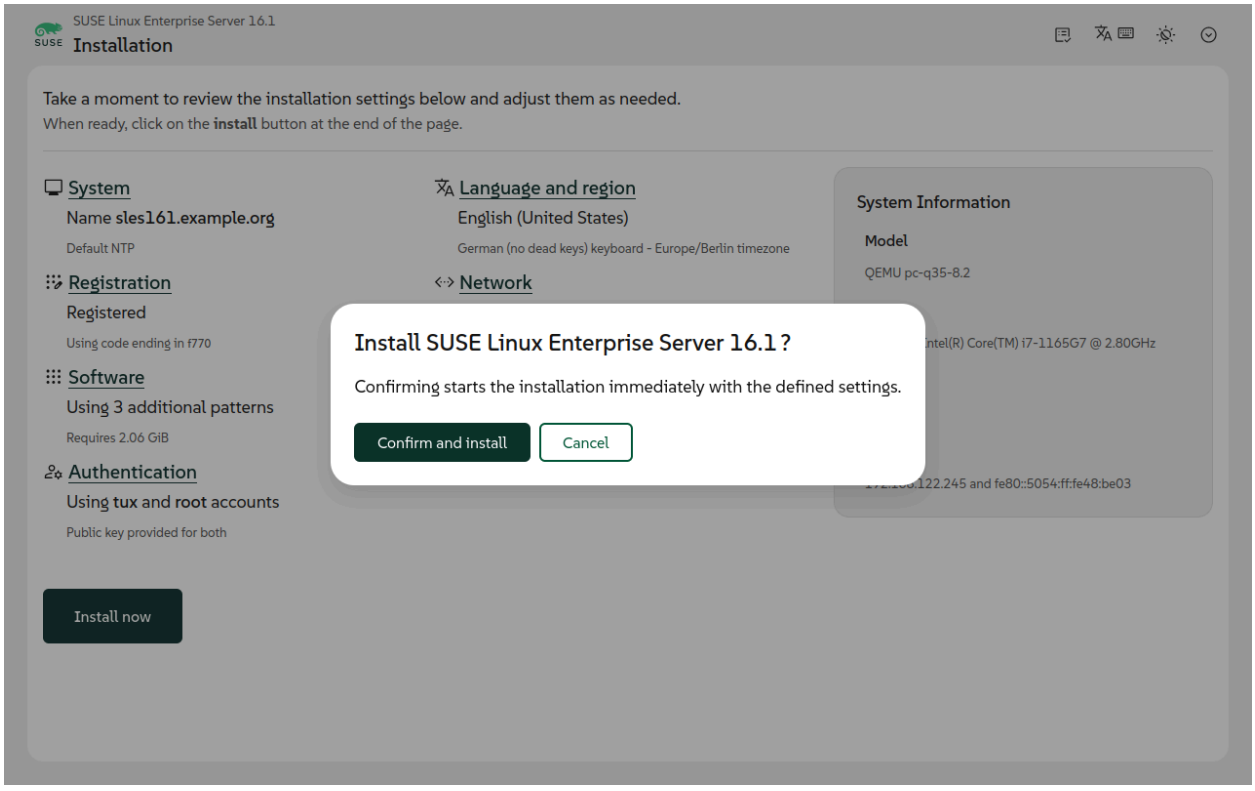


FIGURE 11: AGAMA INSTALLER INSTALLATION CONFIRMATION

Click *Confirm and install* to start the installation.

Wait for the system installation to complete. The time of the installation depends on the system's performance, the installation size and your network connection speed.



Tip: Installation logs

You can use the arrow menu in the top right corner of the window to view the logs and system messages.

12 Rebooting the system

When the installation completes, click *Reboot*.

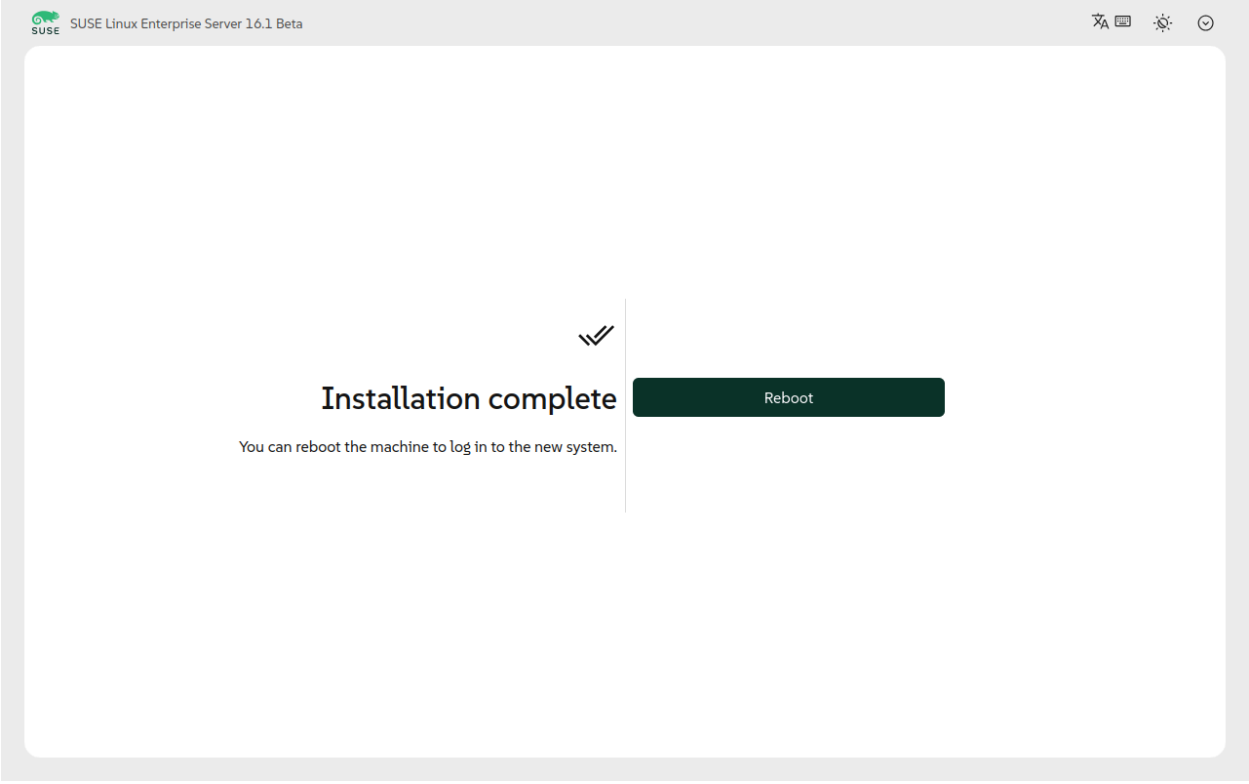


FIGURE 12: AGAMA INSTALLER REBOOT DIALOG

Once the installation is complete, select *Reboot*.

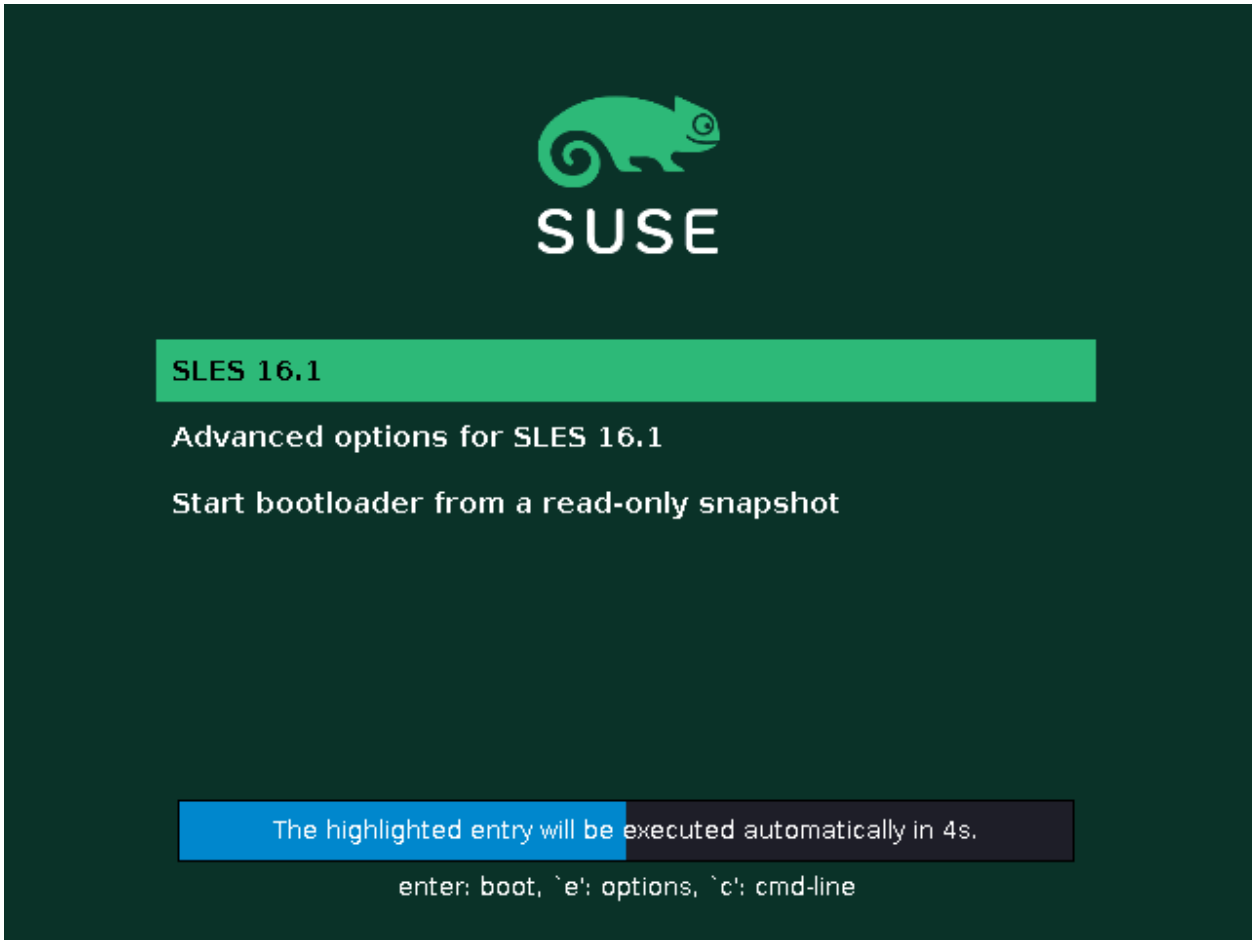


FIGURE 13: REBOOT

In the GRUB 2 boot menu, start the newly installed system.

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0. PREAMBLE

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