

SUSE Linux Enterprise Server for Arm 15 SP6

Raspberry Pi Quick Start

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This guide contains an overview of SUSE Linux Enterprise Server for Arm on the Raspberry Pi* platform and will guide you through the setup procedure.

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1 Platform overview

To use SUSE Linux Enterprise Server for Arm on Raspberry Pi, a 64-bit Arm* compatible Raspberry Pi* is required. SUSE Linux Enterprise Server for Arm 15 SP6 is tested to work on Raspberry Pi 3 Model A+, Model B, Model B+, and Raspberry Pi 4 Model B boards as well as on Raspberry Pi Compute Module 3 and 3+ on MyPi Industrial IoT Integrator Board.

1.1 Technical details of the Raspberry Pi 3 model B

Raspberry Pi is a series of small single-board computers based on a System-on-a-Chip (SoC) by Broadcom*, featuring various peripherals on the board.

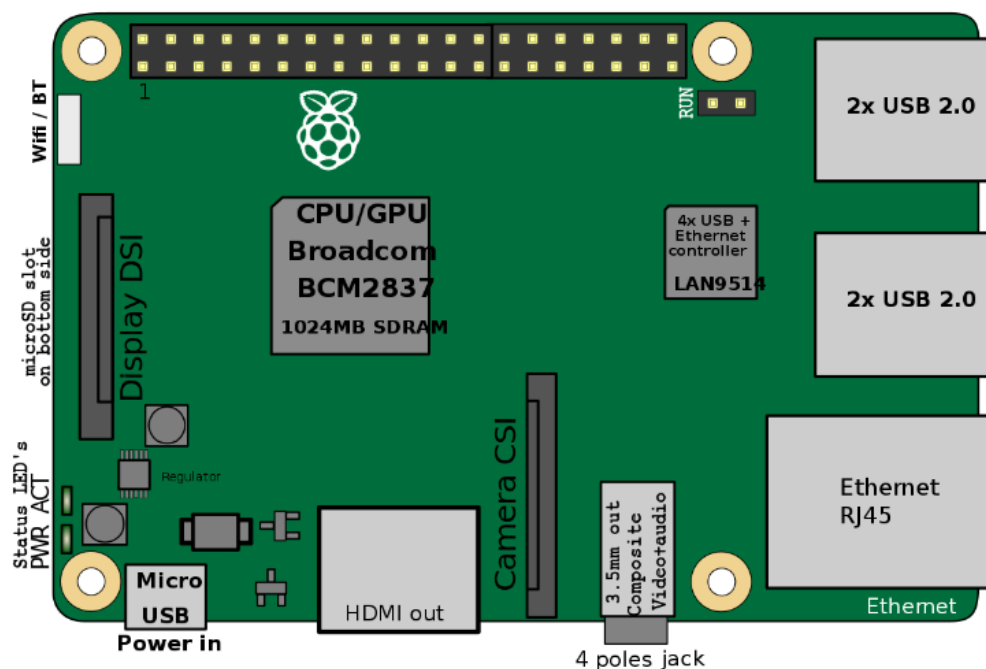


FIGURE 1: OVERVIEW OF RASPBERRY PI 3 MODEL B CONNECTORS, © EFA / ENGLISH WIKIPEDIA / CC BY-SA 3.0

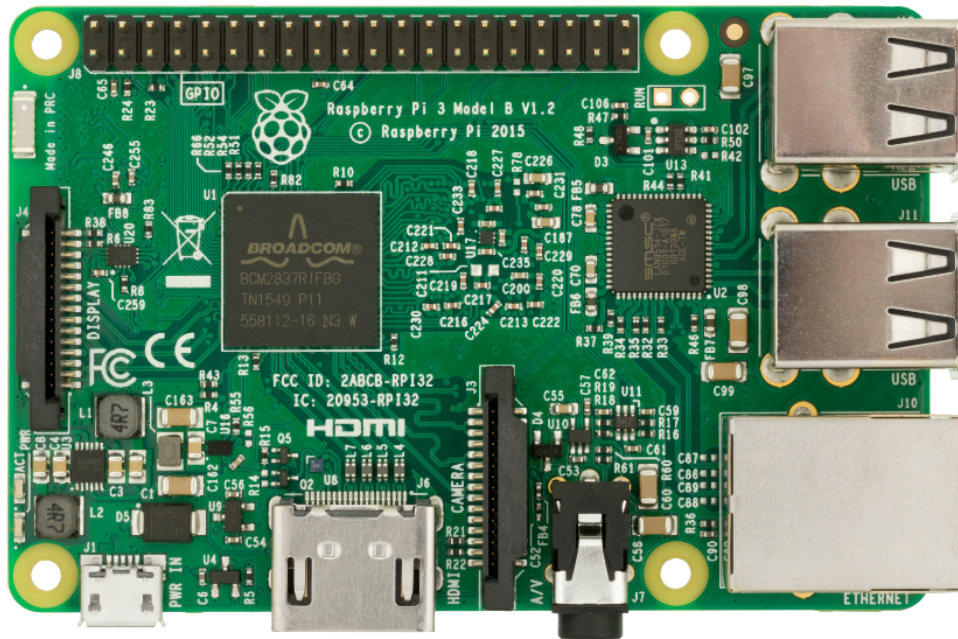


FIGURE 2: PHOTO OF RASPBERRY PI 3 MODEL B CONNECTORS, © EVAN-AMOS / OWN WORK / PUBLIC DOMAIN

SELECTED FEATURES OF RASPBERRY PI 3 MODEL B/B+

CPU

The Broadcom BCM2837 SoC includes a quad-core Arm* Cortex*-A53 Application Processor supporting the Armv8 32-bit and 64-bit instruction sets. With the default configuration, it is clocked up to 1.2 GHz.

RAM

1024 MiB DDR2 memory mounted on the back of the board.

Graphics

Broadcom* VideoCore* IV providing OpenGL* ES 2.0 support. Displays can be connected over HDMI*, composite (TRRS jack), or MIPI* DSI* (ribbon cable).

Ethernet

A USB Ethernet controller on the board provides 10/100 Mbit/s Ethernet (Model B) or 10/100/1000 Mbit/s Ethernet with a maximum throughput of 300 Mbit/s (Model B+).

WLAN

The BCM43438 chip on Model B supports IEEE-802.11b, IEEE-802.11g, and IEEE-802.11n in the 2.4 GHz band. It also provides Bluetooth 2.0 to 4.1 (Low Energy). The BCM43455 chip on Model B+ supports IEEE-802.11b, IEEE-802.11g, IEEE-802.11n, and IEEE-802.11ac in the 2.4 GHz and 5 GHz bands. It provides Bluetooth 4.2 (Low Energy).

Storage

The microSDHC card slot allows for a memory card to be inserted as the primary boot medium.

Power

Raspberry Pi 3's main power source is the Micro USB connector. If your Raspberry Pi comes with a power supply, it is recommended to use the bundled power supply only.

USB

A total of four USB 2.0 ports are available.

Connectors

A 0.1 inch multi-function pin header is also available. Note that not all functionality of this header is exposed in SUSE Linux Enterprise Server for Arm 15 SP6.

1.2 SUSE Linux Enterprise Server for Arm 15 SP6

SUSE Linux Enterprise Server for Arm is the first fully supported commercial Linux operating system product available for Raspberry Pi. You can purchase subscriptions which entitle you to receive all released bug and security fixes, feature updates, and technical assistance from SUSE's worldwide support. Learn more about subscription and support options at https://www.suse.com/support/programs/subscriptions/?id=SUSE_Linux_Enterprise_Server.



Note: Trial version

If you want to try out SUSE Linux Enterprise Server for Arm 15 SP6 on Raspberry Pi, SUSE will provide you with a trial version. This gives you access to free patches and updates for a period of 60 days. You must log in to the SUSE Customer Center at <https://scc.suse.com/> using your Customer Center account credentials to receive this free offer. If you do not have a Customer Center account, you must create one to take advantage of the trial version.

Minimum System Requirements for Installation

- Raspberry Pi 3 Model A +, B, or B +, or Raspberry Pi 4 Model B.
- microSD card with at least 8 GB capacity.

- USB keyboard, mouse.
- HDMI cable and monitor.
- Power supply with at least 2.5 A capacity.

1.2.1 Differences compared to Raspberry Pi OS

Raspberry Pi OS is the de-facto default distribution for Raspberry Pi. The following paragraphs provide a short overview of differences between SUSE Linux Enterprise Server for Arm on Raspberry Pi and Raspberry Pi OS.

Based on upstream kernel

Raspberry Pi OS uses a kernel with modifications especially for Raspberry Pi. SUSE Linux Enterprise Server for Arm uses the default SUSE Linux Enterprise kernel for AArch64, which is derived from the official mainline kernel.

AArch64 instruction set

SUSE Linux Enterprise Server for Arm on Raspberry Pi is the first distribution for Raspberry Pi using the AArch64 instruction set.

Boot process

In Raspberry Pi OS, the kernel is loaded directly. This is not supported by SUSE Linux Enterprise Server for Arm, where the U-Boot boot loader is used to provide an EFI boot environment. A GRUB2 EFI binary is chain-loaded to provide a graphical boot screen.

Root file system

SUSE Linux Enterprise Server for Arm for Raspberry Pi uses Btrfs as the file system for the root partition. Compression is enabled by default for better SD card performance.

1.2.2 YaST

YaST is the installation and configuration framework for SUSE Linux Enterprise. It is popular for its ease of use, flexible graphical interfaces and the capability to customize your system quickly during and after installation. YaST can be used to configure your entire system: You can configure hardware, set up networking, manage system services, and tune your security settings. All these tasks can be accessed from the YaST control center. To start it, choose YaST in the menu or run the command `xdg-su -c yast2`. You will be prompted to enter the password of the root user.

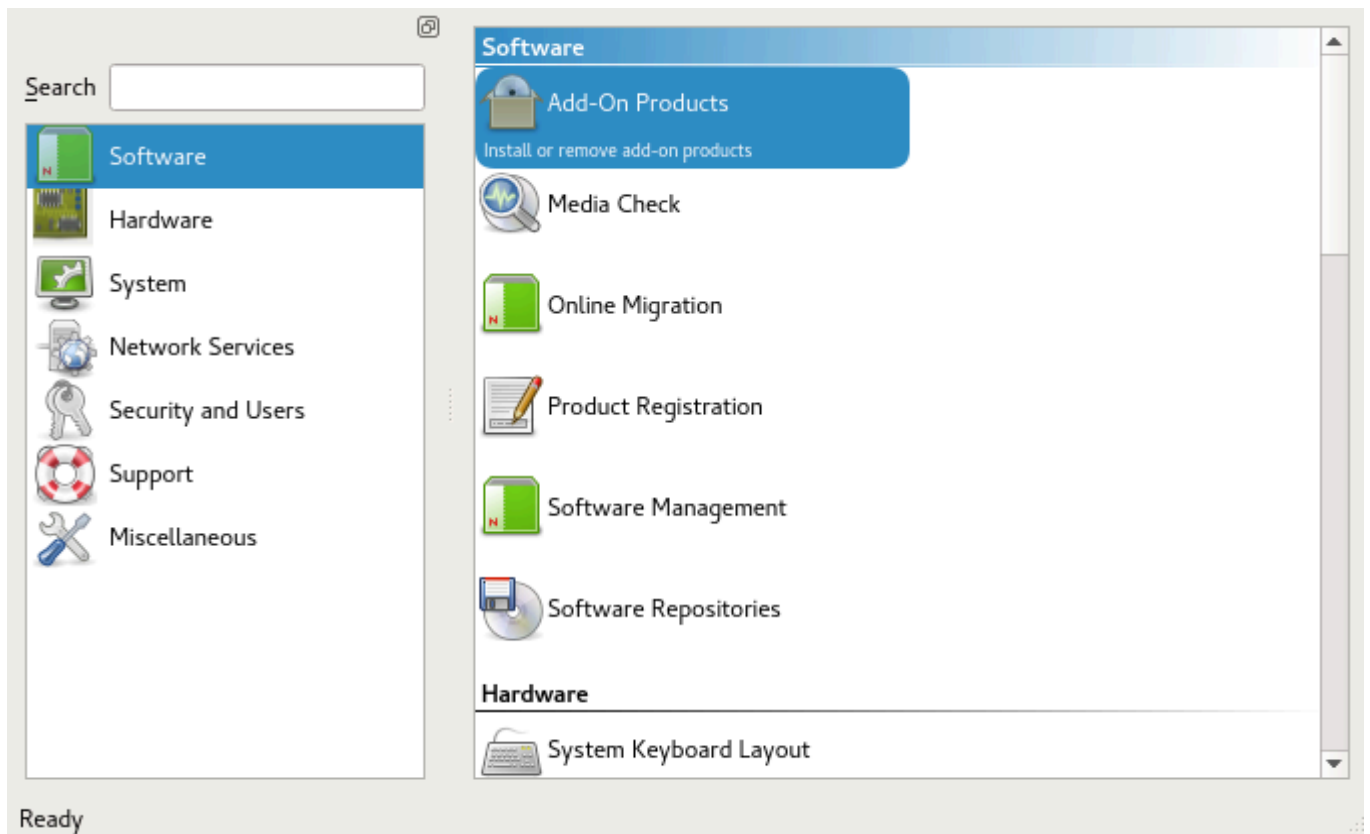


FIGURE 3: THE YAST CONTROL CENTER

When started, YaST shows an overview of available modules (*Figure 3, “The YaST control center”*). Simply click an icon to open a module.

1.2.3 Zypper

Zypper is the package manager for SUSE Linux Enterprise. It is the tool for installing, updating, and removing packages and for managing repositories.

The general syntax for Zypper invocations is:

```
zypper [global-options] command [command-options][arguments] ...
```



Note: Short command form

For most commands, there is both a short and a long form. An overview is available with **zypper --help**.

Installing a package

```
# zypper install mplayer
```

Removing a package

```
# zypper remove mplayer
```

List available patches

```
> zypper list-patches
```

Install available patches

```
# zypper patch
```



Note: Installing software updates

The recommended way to install available software updates is by using the YaST Online Updater. To start it, choose “Online Update” in “Settings” under “Desktop Apps” in the IceWM menu.

1.2.4 Limitations

Graphics not hardware-accelerated

X.Org hardware acceleration is disabled to improve system stability and reliability.

For other limitations refer to the online version of the Release Notes at <https://www.suse.com/releases/notes/aarch64/SUSE-SLES/15-SP6/>.

2 Installation

SUSE Linux Enterprise Server for Arm for Raspberry Pi is distributed as an XZ-compressed image file for microSD cards. This section will guide you through the process of preparing the card for the first boot. If you already have a microSD card containing the image, you can skip this section and go straight to [Section 3, “First boot”](#).



Note: SD card space requirements

It is recommended to use a card with a capacity of at least 8 GB.



Warning: All data on the card will be lost!

By following the procedure below, all data on the SD card will be overwritten and therefore irrevocably lost. Be very careful when choosing the destination device of the image writing process.

2.1 Preparing the card on Linux

Before and after you plug in the SD card, run the `lsblk` command. Between the two runs of `lsblk`, there should be a difference of one or more lines. The first column and first row is the name of the node representing the SD card in your system. To write the image to the card, use the `dd` command:

```
xz -cd IMAGE | dd of=/dev/SDCARDDEV bs=4096
```

EXAMPLE 1: WRITING THE IMAGE TO THE CARD USING `dd`

This command decompresses the image `SLES15-SP6-Minimal-Image.aarch64-15.6-RaspberryPi-GM.raw.xz` to the SD card `mmcblk0`:

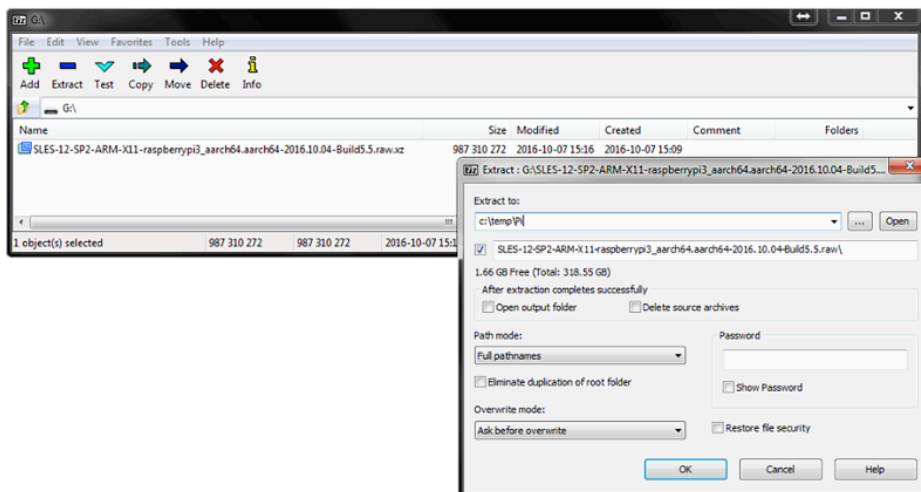
```
> xz -cd SLES15-SP6-Minimal-Image.aarch64-15.6-RaspberryPi-GM.raw.xz | sudo dd of=/dev/mmcblk0 bs=4096 iflag=fullblock status=progress
```

2.2 Preparing the card on Microsoft Windows operating systems

The following steps will guide you through the installation of the image onto the SD card on Microsoft® Windows® operating systems. You need to meet these prerequisites:

- Latest available image of SUSE Linux Enterprise Server for Arm for Raspberry Pi
- Easy 7-Zip from <http://www.e7z.org/> 
- Win32 Disk Imager from <https://sourceforge.net/projects/win32diskimager/> 

1. Open the downloaded image using Easy 7-Zip. Extract the file content into a directory with sufficient free space.



2. Run Win32 Disk Imager and select the extracted file as *Image File*. Then, choose the correct drive letter as *Device*. Click *Write* to start the procedure.





Note: Finding the correct device

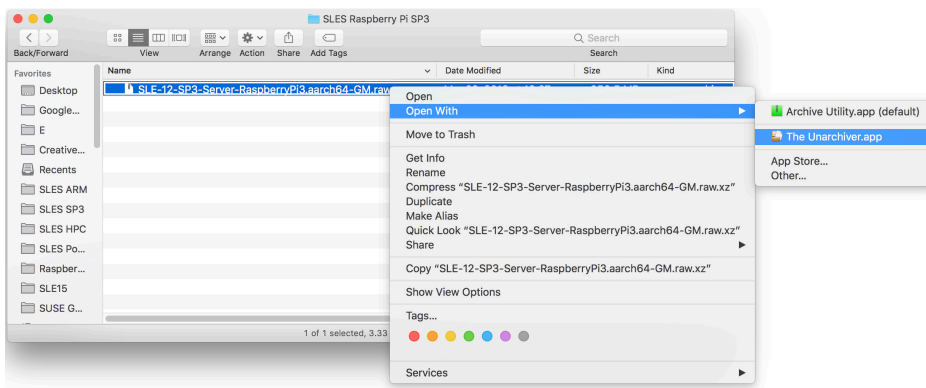
If you are unsure which drive letter to choose from in the list, remove the SD card and run Win32 Disk Imager again. The option that disappeared is the right target device.

2.3 Preparing the card on macOS

The following steps will guide you through the installation of the image onto the SD card on macOS®. You need to meet these prerequisites:

- Latest available image of SUSE Linux Enterprise Server for Arm for Raspberry Pi
- The Unarchiver from <https://unarchiver.c3.cx/unarchiver> 

1. Open Finder at the location where the downloaded image is stored. Use the *Open With* selection to choose **The Unarchiver** instead of the default **Archive** utility and extract the content into a directory with sufficient free space.



2. Open a terminal window and change into the destination directory of the uncompressed image. Enter `diskutil list` before and after the SD card is inserted to find out which device to use.
3. Run `diskutil unmountDisk /dev/diskX`, where `X` is the disk number from the previous step.
4. Run `sudo dd bs=4096 if=imageFile.raw of=/dev/diskX`, where `X` is the disk number and `imageFile.raw` is the name of the uncompressed image.

```
> sudo dd bs=4096 if=SLES15-SP6-Minimal-Image.aarch64-15.6-RaspberryPi-GM.raw.xz  
of=/dev/disk4  
Password:  
5550+0 records in  
5550+0 records out  
5819596800 bytes transferred in 1131.796649 secs (5141910 bytes/sec)
```

5. Now unmount the disk (which is now labelled *EFI*) as usual.

3 First boot

To boot Raspberry Pi from the prepared microSD, insert the card into the card slot, then connect a display, an Ethernet cable, a USB keyboard, and a mouse. Power Raspberry Pi. If everything works, you should see the text on the screen.



Note: Operation without mouse

The JeOS First Boot Assistant can be controlled using the keyboard only. Each user interface element has an accelerator, shown as a highlighted character. To activate an accelerator, press **Alt** and the appropriate character.

During the first boot, the system expands to make use of the entire storage card. This operation may take a while.

3.1 Initial system setup with JeOS First Boot Assistant

After the boot is completed, the JeOS First Boot Assistant leads you through the initial system setup.

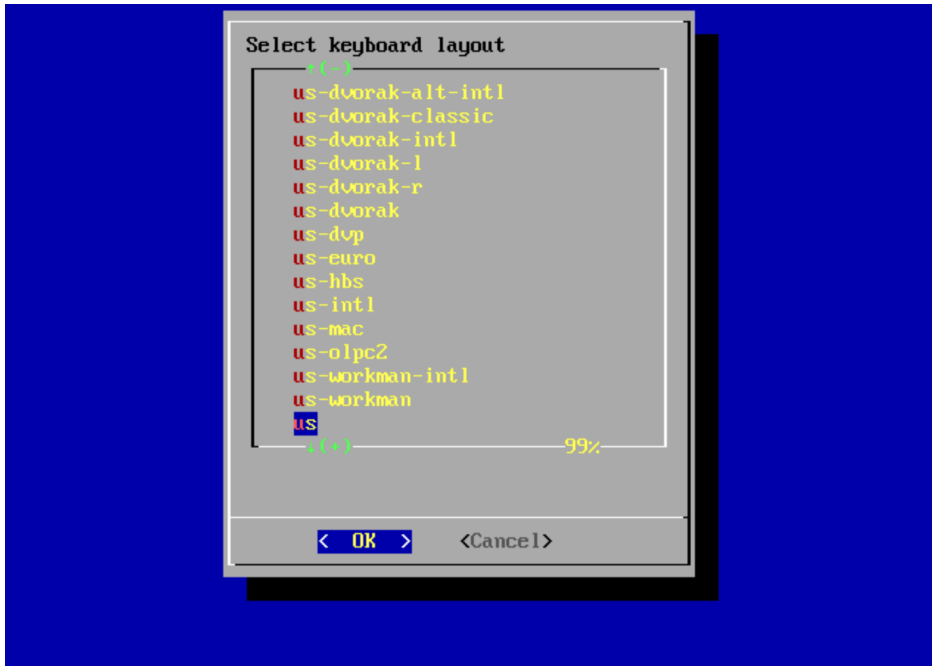


Note: JeOS First Boot Assistant via a serial connection

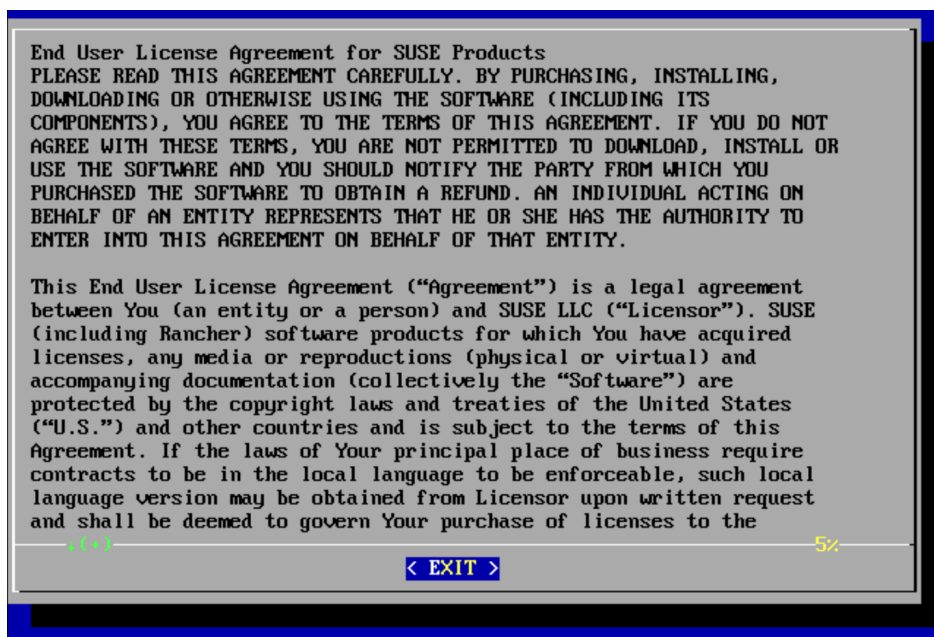
To run the JeOS First Boot Assistant wizard via a serial connection, you need to remove the `console=tty` from the kernel command line `console=ttyS0,115200 console=tty` in GRUB 2 even if there is no HDMI cable connected.

The minimal JeOS image comes without language selection. After the assistant finishes, you will be able to install and select your system locale. You can start JeOS First Boot Assistant at any time using the `jeos-config` command.

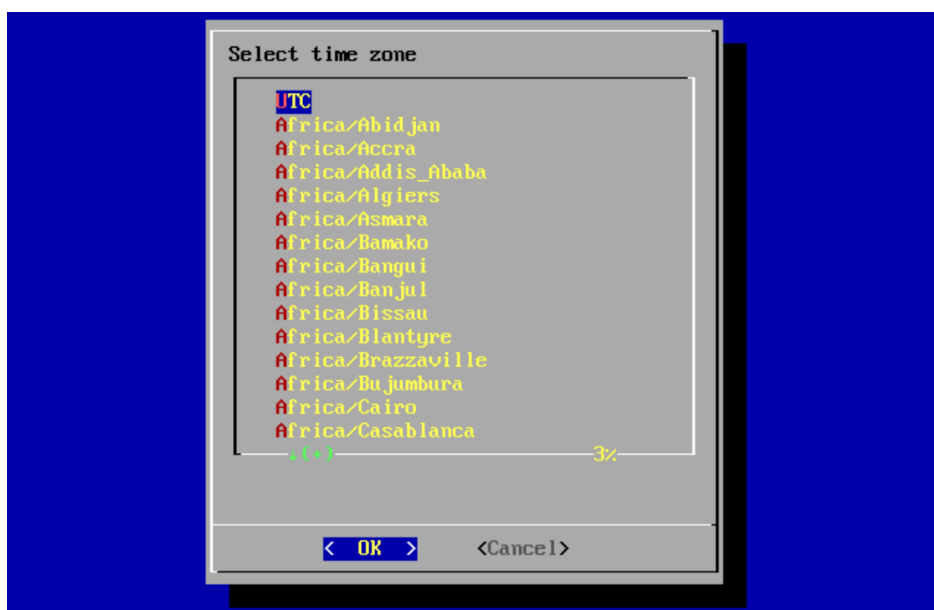
1. First, the keyboard layout needs to be configured. Use the arrow keys or first letter and select *OK*.



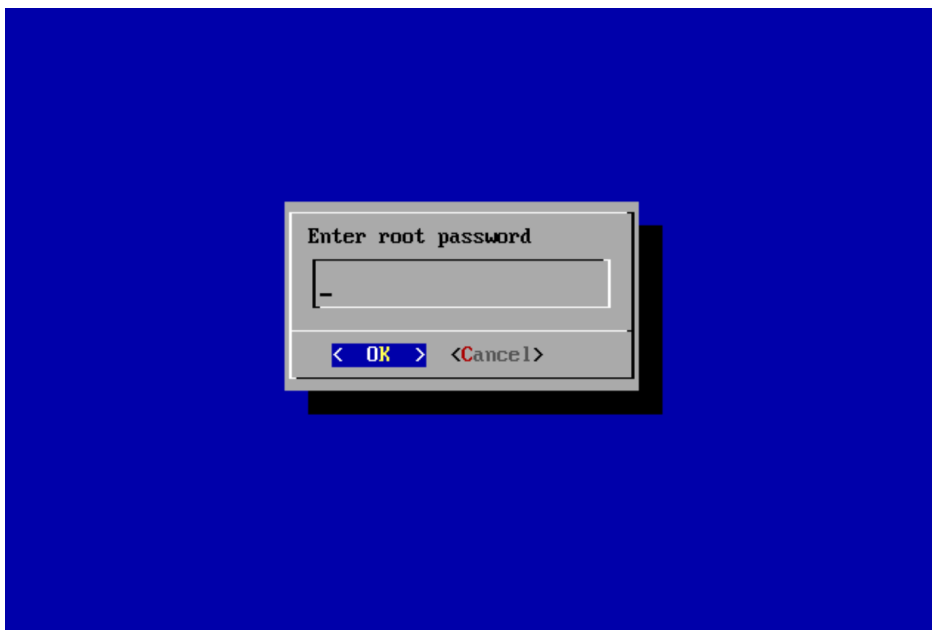
2. Read the License Agreement. You need to accept it.



3. Select the time zone by using the arrow keys or first letter.



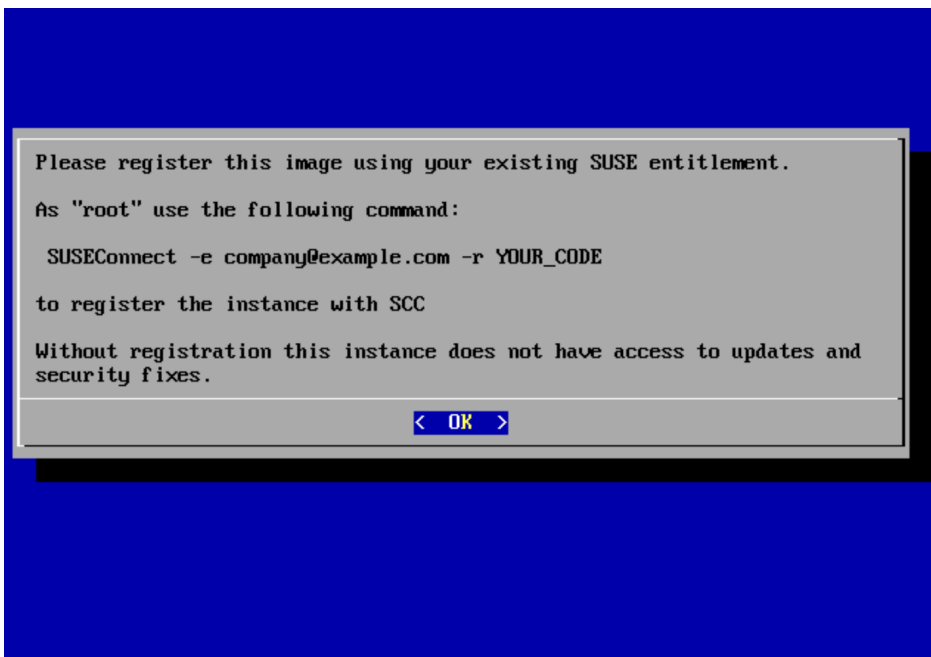
4. Select OK to proceed.
5. You will be asked to provide a root password now. Do not forget what you enter here, as you will need it for administration.



6. Confirm the root password you just provided by typing it in again.



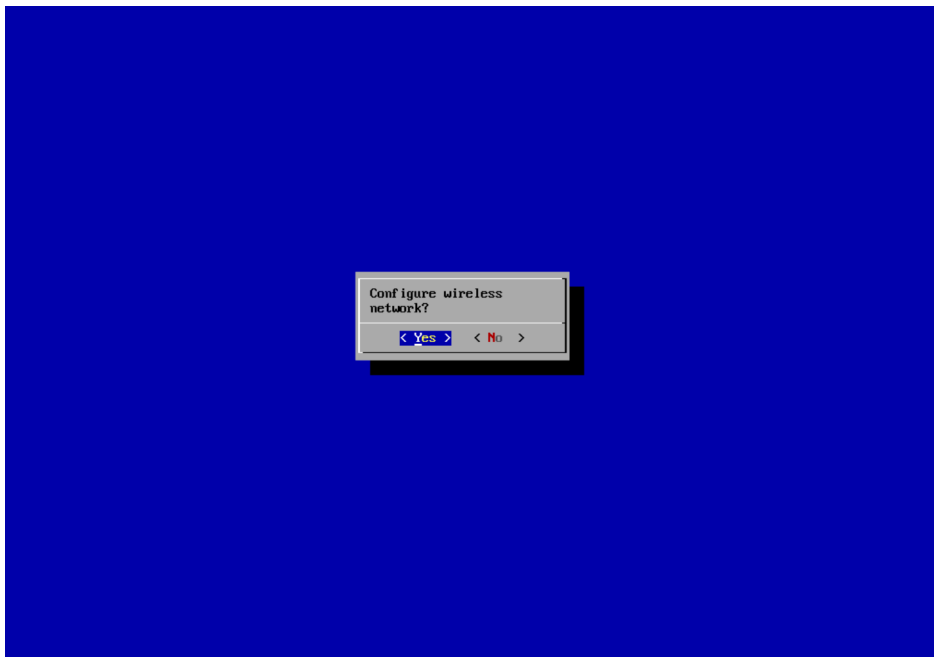
7. Note that you should register your system after installation, as detailed in [Section 3.2, "Registration process"](#).



Note: Deferring registration

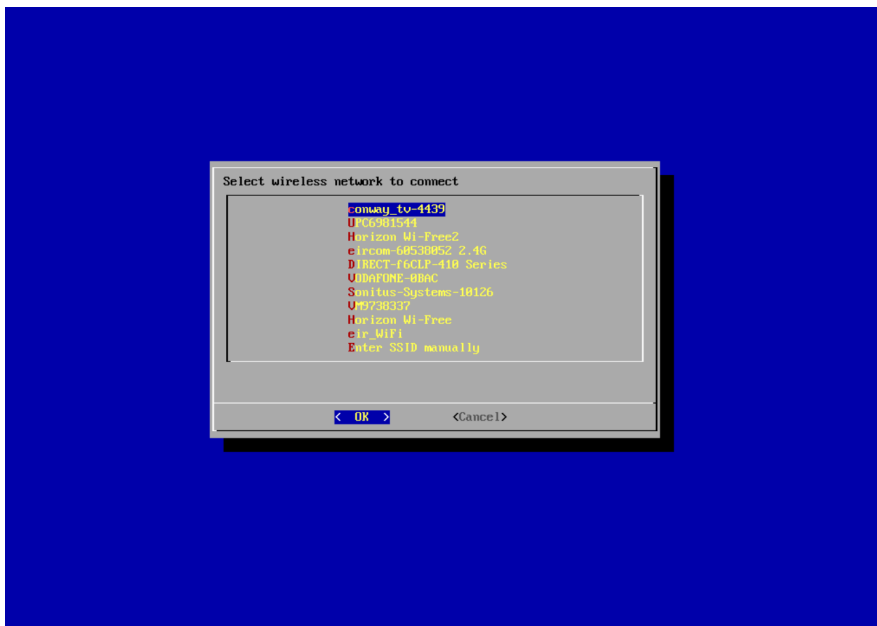
You will not receive updates or patches until you register using *SUSEConnect*.

8. Select *OK* to continue.
9. Finally, you are offered the option to configure a wireless network. If you have a wired Ethernet connection, you can skip this step by selecting *No*.

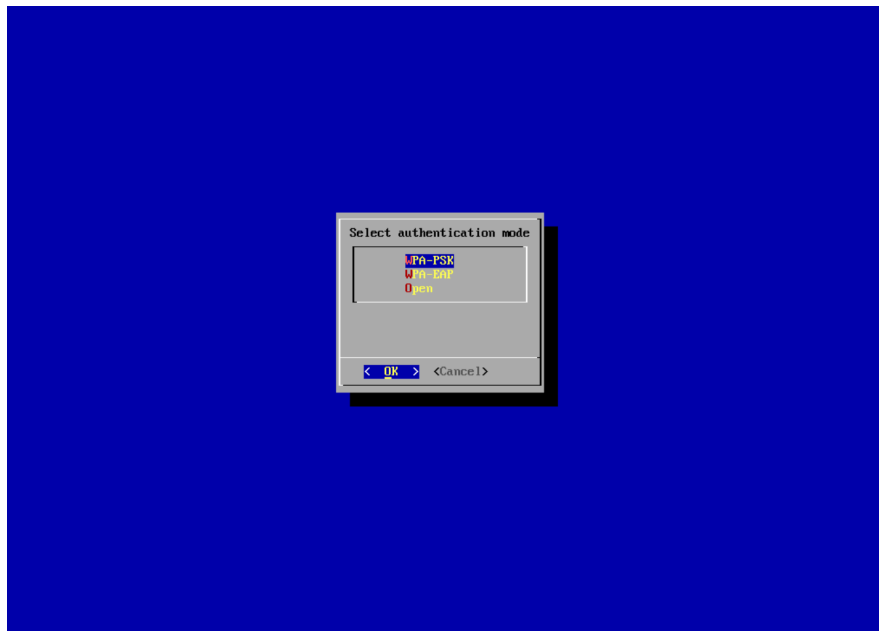


If you select *Yes*, you will see the following screens:

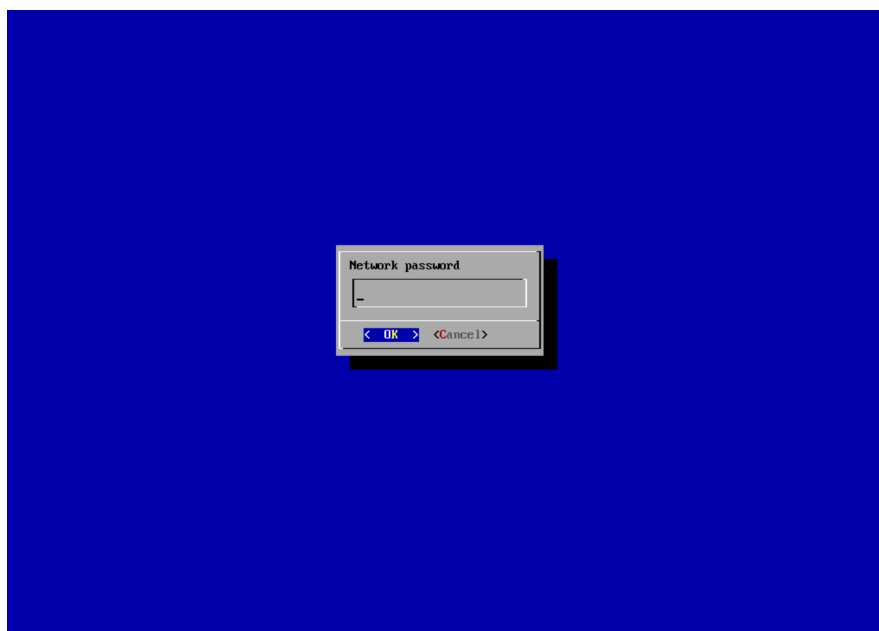
- a. Select a wireless network to connect to and proceed with *OK*.



- b. Select the authentication method for the wireless network and proceed with *OK*.



- c. Enter the passphrase for the wireless network and proceed with *OK*.



Note: WPA EAP authentication

WPA authentication supports just the mschapv2 EPA authentication, which is used as default.

If you chose to skip configuration of wireless networks or if you fully completed their configuration, the JeOS First Boot Assistant will exit. The system continues to boot to a login prompt. You can now log in as `root` user with the password you chose earlier.



Note: Canceling the JeOS First Boot Assistant

If at any point you select to *Cancel* the assistant, the system will shut down. You can then disconnect the power supply, make any necessary changes, and start over.

3.2 Registration process

It is very important to register your SUSE Linux Enterprise Server for Arm subscription to ensure full functionality of your Raspberry Pi system. The SD card image provided by SUSE contains a minimal set of packages that are intended for the initial boot process and to get your Raspberry Pi onto the network.

When you have registered your SUSE Linux Enterprise Server for Arm subscription, you can download other packages you may need, such as compilers. The SUSE Linux Enterprise Server version that runs on your Raspberry Pi is the same version that runs on AMD64/Intel 64, POWER, IBM Z, or on other Arm-based systems.




Important: Setting the clock

Because Raspberry Pi does not have a persistent Real Time Clock, make sure that the clock is set to the current date and time before attempting to use Zypper or YaST to install additional packages.

You can initially register your system with the *SUSEConnect* tool. Afterwards, you can also make use of the *YaST Product Registration* module.



Note: Evaluation code

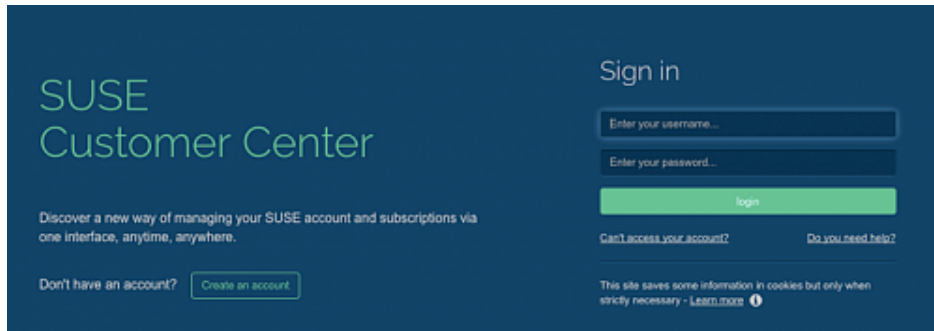
Sixty-day evaluation subscriptions may be requested at the following page: <https://www.suse.com/products/arm/> 

After you have obtained a registration code from a subscription card, you need to activate your subscription on the SUSE Customer Center at:

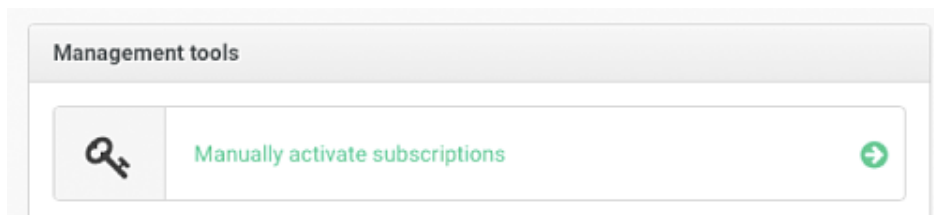
<https://scc.suse.com/> 

To register your subscription, perform the following steps:

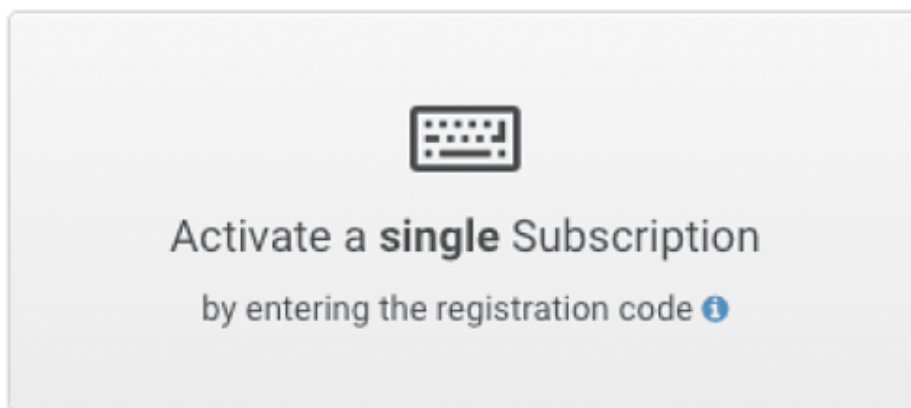
1. Log in to the SUSE Customer Center using a browser on another machine. Create an account if required:



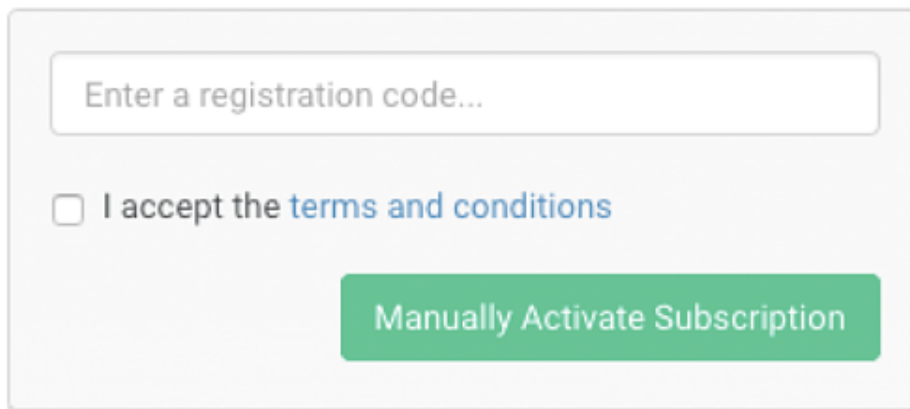
2. Click *Manually Activate Subscriptions*:



3. Click the dialog field *Activate a single subscription*:



4. Enter the registration code and accept the terms and conditions:



Enter a registration code...

☐ I accept the [terms and conditions](#)

Manually Activate Subscription

5. Confirm the subscription activation and the organization assignment. Click *Activate*:

You have provided 1 subscription to be activated.

Name	Expiry date	Systems (registration code)
SUSE Linux Enterprise Server, Raspberry Pi, 1 Physical Server, Self-Support Subscription		9 of 1 Physical Servers

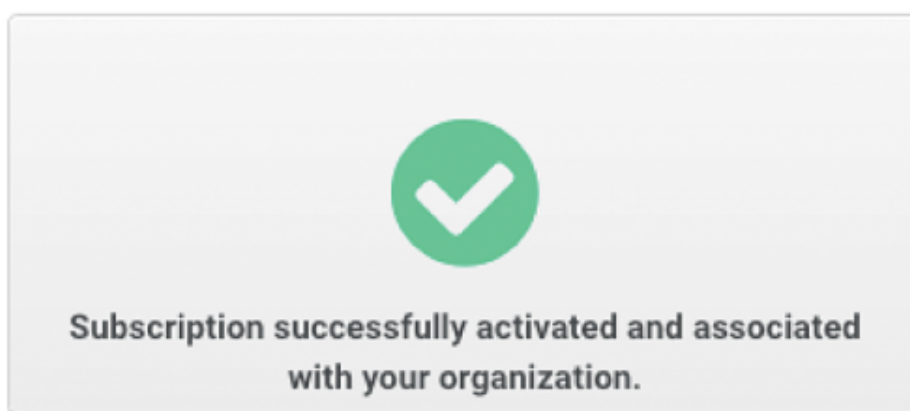
Please select an organization for the subscription:

My organizations

For Personal Use (WC2240136)

✓ Activate

6. Your subscription is now active and ready to be used:



To register the system, use the *SUSEConnect* tool as instructed earlier:

```
# SUSEConnect -e company@example.com -r YOUR_CODE
Registering system to SUSE Customer Center
Using E-Mail: company@example.com

Announcing system to https://scc.suse.com ...

Activating SLES 15.6 aarch64 ...
-> Adding service to system ...

Activating sle-module-basesystem 15.6 aarch64 ...
-> Adding service to system ...
-> Installing release package ...

Activating sle-module-server-applications 15.6 aarch64 ...
-> Adding service to system ...
-> Installing release package ...

Successfully registered system
```

This may take a few moments. Afterwards, you will have access to online repositories for installing more packages, as described in [Section 1.2.3, “Zypper”](#).

EXAMPLE 2: INSTALLING YAST

Later sections may assume you have installed YaST for system configuration:

```
# zypper in -t pattern yast2_basis
```



Note: Module availability

Your subscription gives you access to more than the above *Basesystem Module* and *Server Applications Module*. To activate additional modules, you can use the *YaST System Extensions* module.

4 Initial system configuration

In this section, it is explained how to perform the initial system configuration for SUSE Linux Enterprise Server for Arm for Raspberry Pi 15 SP6.

4.1 Changing the language

Follow these steps to change the default language:

1. Install the `glibc-locale` package:

```
# zypper in glibc-locale
```

2. Set the language as desired:

```
# localectl set-locale LANG=de_DE.UTF-8
```



Note: Translation packages

Certain applications may require you to install an additional `-lang` package before you can see texts translated to the chosen language.

4.2 Changing the host name

Follow these steps to change the default host name:

1. Open the YaST network module either by running `yast2 lan` or clicking the network icon in the YaST control center.
2. Select *Hostname/DNS* in the top tab bar.
3. Type the new host name into the *Hostname* field.
4. Click *OK* to save the change. After YaST exits, you need to log out and in again.

4.3 Setting up networking

The default configuration has DHCP enabled on the Ethernet port. If that suits your network environment, you can skip this section. If you require the use of a static IP address, use YaST:

1. Open the YaST network module either by running `yast2 lan` or clicking the network icon in the YaST control center.
2. In YaST, you will see the network interface being selected. Select the built-in Ethernet and choose *Edit* to open the address configuration.

3. Select *Statically Assigned IP Address* and type in the desired values for *IP Address* and *Subnet Mask*. Click *Next*.
4. With a static network configuration, you will also need to specify a DNS server (if applicable) and a gateway. For the gateway, select *Routing* in the tab bar and enter the IPs of the gateways into the specific fields.
5. The DNS server is set in the *Hostname/DNS* tab. After choosing that tab, enter the IPs of the name servers into the respective *Name Server* fields.

Similarly to the procedure described above, YaST also lets you configure the built-in Wi-Fi network adapter.

For detailed information about the network configuration in SUSE Linux Enterprise Server for Arm, consult the respective sections of the *SUSE Linux Enterprise Server Deployment and Administration* guides at <https://documentation.suse.com/sles/>.

5 General system usage

After the initial configuration procedure and the first boot of the system, you can now use various components of the system.

5.1 Desktop

SUSE Linux Enterprise Server for Arm for Raspberry Pi 15 GA had packages for a minimal X11 desktop (IceWM) preinstalled.

SUSE Linux Enterprise Server for Arm for Raspberry Pi 15 SP6 comes as a tiny text-based appliance, allowing you to install any available desktop of your choice or none for headless usage. Should you want to re-create the package selection of the previous images, a pattern `x11_raspberrypi` is provided for convenience.

If not done already, you will need to enable the *Desktop Applications Module*. Assuming you have registered the base product already, as described in [Section 3.2, “Registration process”](#), the fastest way to enable the module is:

```
# SUSEConnect -p sle-module-desktop-applications/15.6/aarch64
Registering system to SUSE Customer Center

Updating system details on https://scc.suse.com ...
```

```
Activating sle-module-desktop-applications 15.6 aarch64 ...  
-> Adding service to system ...  
-> Installing release package ...  
  
Successfully registered system
```

You can then install the desktop packages pattern:

```
# zypper install -t pattern x11_raspberrypi
```

5.2 Bluetooth

Raspberry Pi 3 and later models have a Bluetooth* controller on-board that can be used for various purposes, such as wireless keyboards, mice, or audio devices.

To use the Bluetooth controller, install the bluez package:

```
# zypper install bluez
```

Then start and enable the bluetooth systemd service:


```
# systemctl enable --now bluetooth
```

You can use **bluetoothctl** to operate the Bluetooth device.

6 Product documentation

This introduction only covered the most basic tasks.

6.1 Product documentation

You can find the complete documentation for SUSE Linux Enterprise Server for Arm 15 SP6 at <https://documentation.suse.com/> .



Note: Applicability of product documentation

Not all content in the product documentation applies to SUSE Linux Enterprise Server for Arm on Raspberry Pi, because Raspberry Pi differs significantly from other hardware platforms.

6.2 SUSE forums

A valid and activated subscription entitles you to receive bug and security fixes, feature updates, and technical assistance from SUSE's support organization. Learn more at <https://www.suse.com/support/>. Via the SUSE Customer Center at <https://scc.suse.com/>, you can open an incident. In addition, SUSE provides a community site where you can get answers to questions. Go to <https://community.suse.com/>.



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