

Introduction to SUSE Linux Enterprise Server for ARM on the Raspberry Pi

SUSE Linux Enterprise Server 12 SP3
Raspberry Pi 3 Model B

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Introduction to SUSE Linux Enterprise Server for ARM on the Raspberry Pi

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 be able to use SUSE Linux Enterprise Server for ARM on the Raspberry Pi, an Arm compatible Raspberry Pi* is required. SUSE Linux Enterprise Server 12 SP3 for ARM is tested to work on a Raspberry Pi 3 Model B board.

1.1 Technical Details of the Raspberry Pi 3 Model B

The 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.

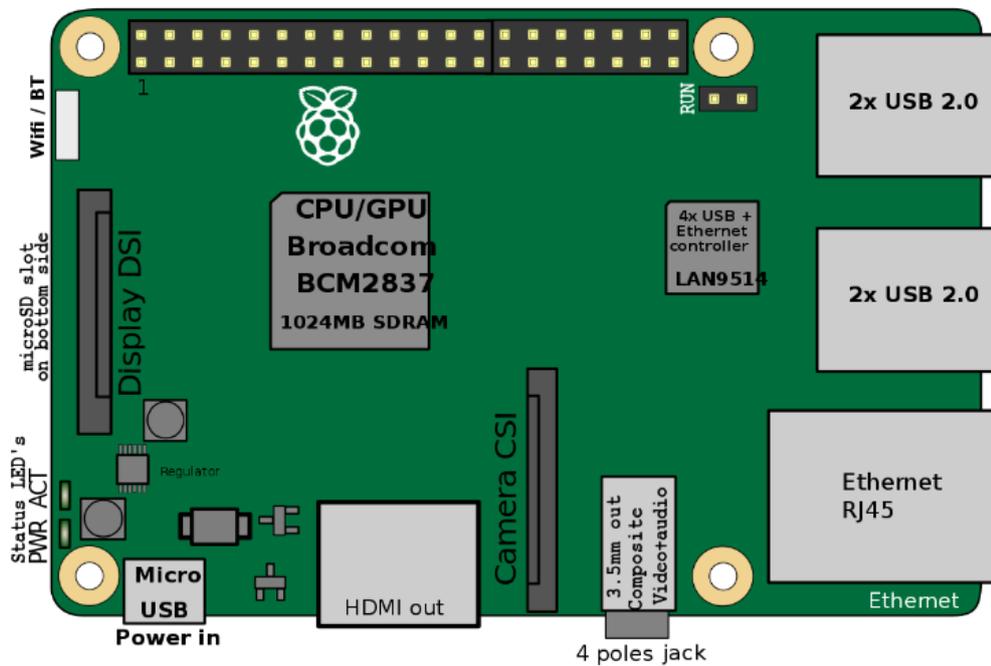


FIGURE 1: OVERVIEW OF THE RASPBERRY PI 3 MODEL B CONNECTORS, © EFA / ENGLISH WIKIPEDIA / CC BY-SA 3.0

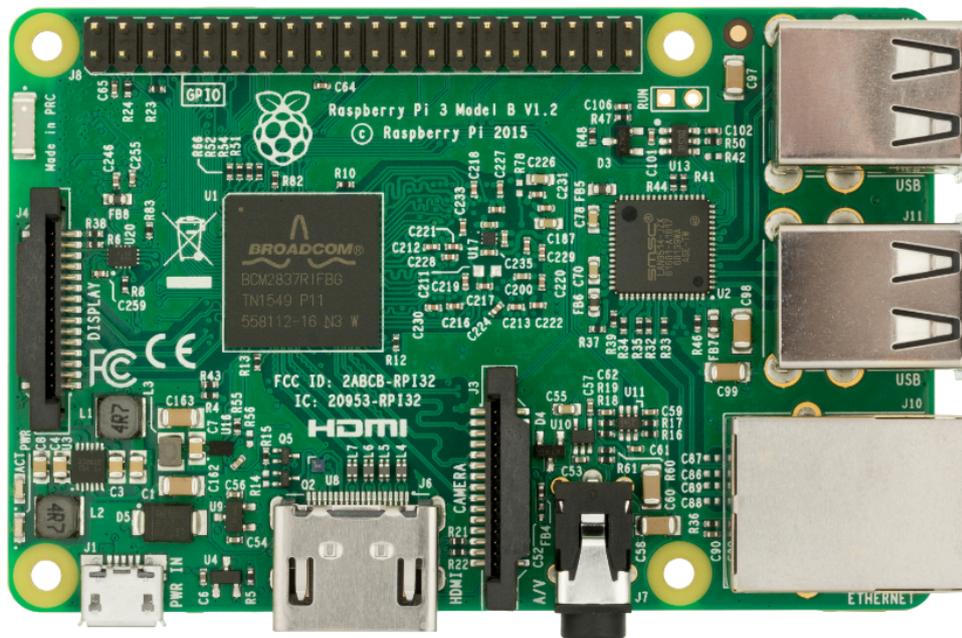


FIGURE 2: PHOTO OF THE RASPBERRY PI 3 MODEL B CONNECTORS, © EVAN-AMOS / OWN WORK / PUBLIC DOMAIN

SELECTED FEATURES OF THE RASPBERRY PI 3 MODEL 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 or composite (TRRS jack).

Ethernet

A USB Ethernet adapter on the board provides 10/100 MBit/s Ethernet.

WLAN

The BCM43438 chip supports IEEE-802.11b, IEEE-802.11g and IEEE-802.11n in the 2.4 GHz band. It also provides Bluetooth 2.0-4.1 (Low Energy).

Storage

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

Power

The Raspberry Pi'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 is 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 on the Raspberry Pi.

1.2 SUSE Linux Enterprise Server for ARM 12 SP3

SUSE Linux Enterprise Server for ARM 12 SP3 is the first fully supported commercial Linux operating system release available for the 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 12 SP3 on the 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 sign in to the SUSE Customer Center at <https://scc.suse.com/login> 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 B
- SD Card with at least 8GB capacity
- USB keyboard, mouse
- HDMI cable and monitor
- Power supply with at least 2.5A capacity

1.2.1 Differences Compared to the Previous Release “SUSE Linux Enterprise Server for the Raspberry Pi”

The previous release of “SUSE Linux Enterprise Server for the Raspberry Pi” (based on SUSE Linux Enterprise Server 12 SP2) was intended for experimental users of SUSE Linux Enterprise Server on the Raspberry Pi platform. It included several large packages such as the C compiler and development tools. The commercial release of the Raspberry Pi image of SUSE Linux Enterprise Server for ARM is different in several ways:

- It is based on the later code base from SUSE Linux Enterprise Server 12 SP3.
- It uses the normal SUSE Linux Enterprise Server for ARM support channels instead of a special purpose “SUSE Linux Enterprise Server for the Raspberry Pi” channel.
- The image is significantly smaller than the previous release to allow the installation to be tailored for the actual use.

Additional packages can be installed by YaST or Zypper after registration. Since many of our customers are interested in using SUSE Linux Enterprise Server for ARM on a Raspberry Pi for industrial monitoring and digital signage, it makes more sense to provide a minimal image that can easily be expanded.

1.2.2 Differences Compared to Raspbian

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

Based on Upstream Kernel

Raspbian uses a kernel with modifications especially for the 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 the Raspberry Pi is the first distribution for the Raspberry Pi using the AArch64 instruction set.

Boot Process

In Raspbian, 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 chainloaded to provide a graphical boot screen.

Root File System

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

1.2.3 YaST

YaST is the installation and configuration framework for SUSE Linux Enterprise. It is popular for its easy use, flexible graphical interfaces and the capability to customize your system quickly during and after the 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 reached 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.

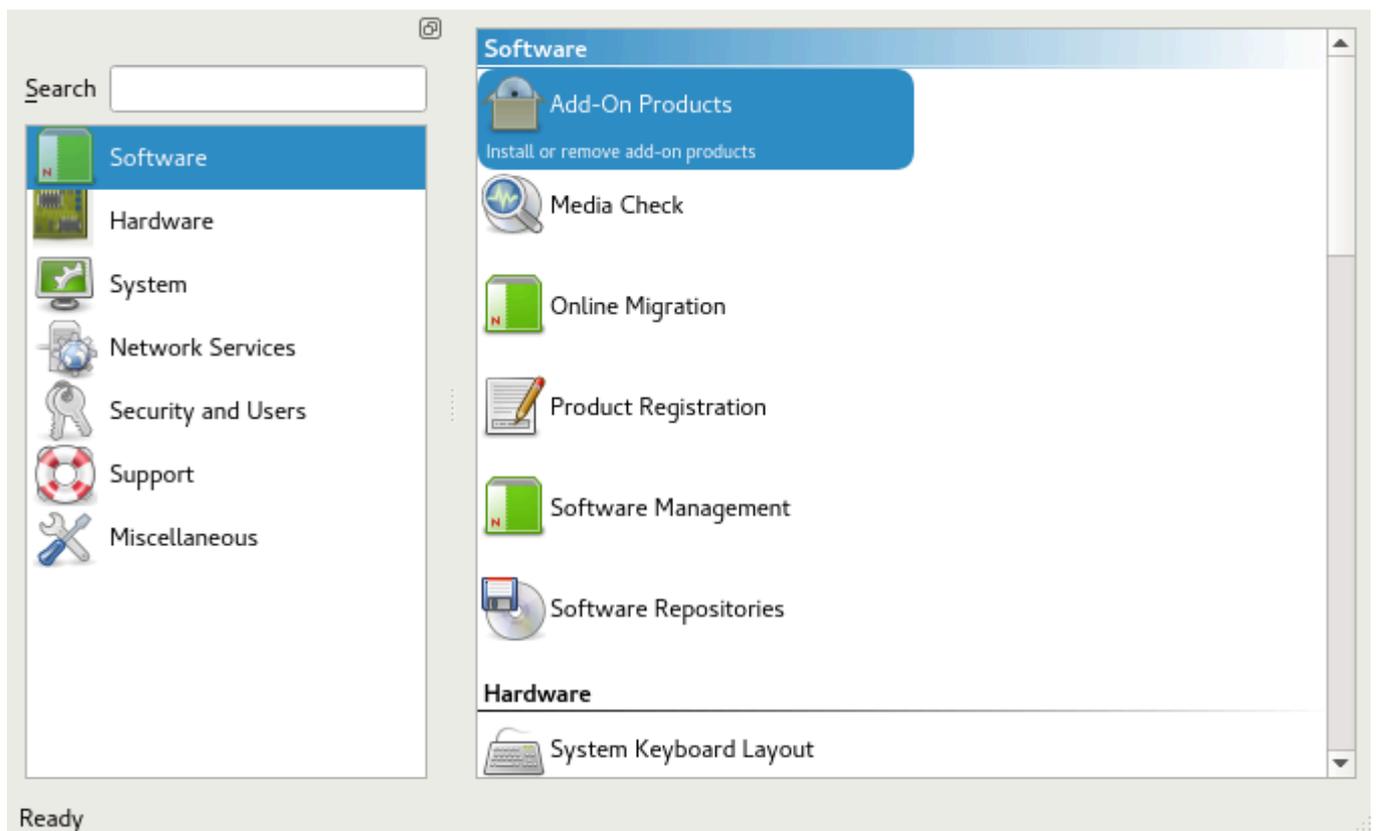


FIGURE 3: THE YAST CONTROL CENTER

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

1.2.4 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 using the YaST Online Updater. To start it, choose “Online Update” in “Settings” under “Desktop Apps” in the IceWM menu.

1.2.5 Limitations

Graphics not hardware-accelerated

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

To enable it, comment out the following line in `/etc/X11/xorg.conf.d/20-kms.conf`:

Option "AccelMethod" "none" by prefixing it with “#”.

For other limitations refer to the online version of the Release Notes at https://www.suse.com/releases/notes/x86_64/SUSE-SLES/12-SP3/.

2 Installation

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



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 `SLE-12-SP3-Server-RaspberryPi3.aarch64-GM.raw.xz` to the SD card `mmcblk0`.

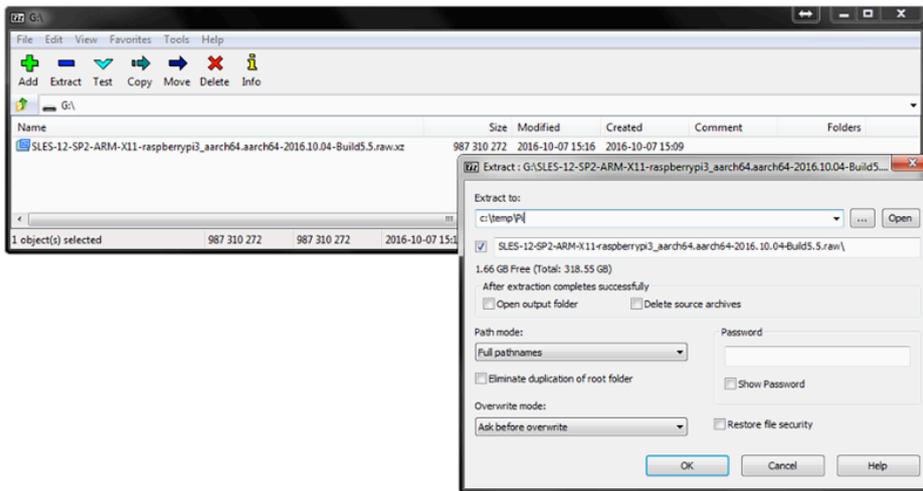
```
xz -cd SLE-12-SP3-Server-RaspberryPi3.aarch64-GM.raw.xz | dd of=/dev/mmcblk0 bs=4096
```

2.2 Preparing the Card on Microsoft Windows* Operating Systems

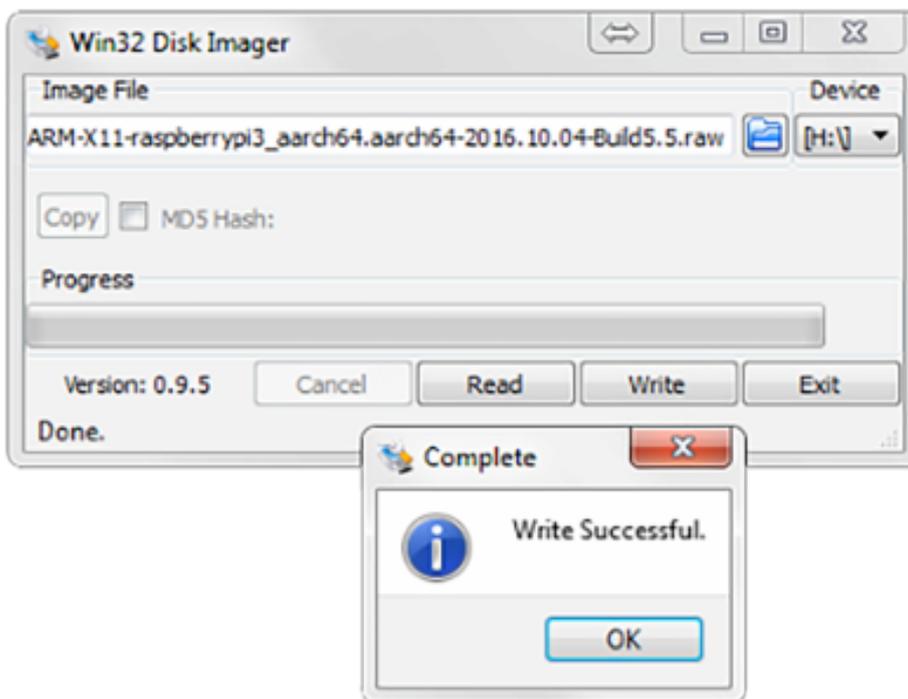
The following steps will guide you through the installation of the image onto the SD card on Microsoft Windows operating systems. You need to meet these prerequisites:

- Latest available image of SUSE Linux Enterprise Server for ARM on the Raspberry Pi
- Easy 7-Zip from <http://www.e7z.org/>
- Win32 Disk Imager from <http://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

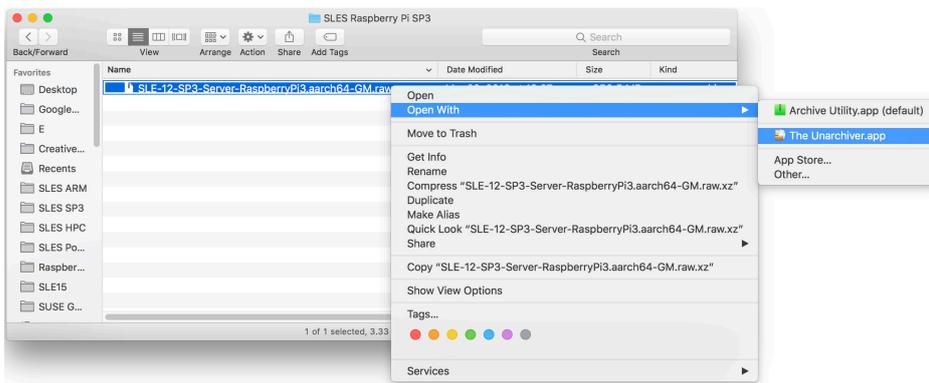
If you are unsure which drive letter to choose from in the list, remove the SD card and run Win32 Disk Imager again. The option that disappeared is the right target device.

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 on the Raspberry Pi
- The Unarchiver from <http://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.

```
tux > sudo dd bs=4096 if=SLE-12-SP3-Server-RaspberryPi3.aarch64-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 Booting for the First Time

After insertion of the prepared microSD card, connect a display, Ethernet and USB keyboard and mouse first, then provide power over Micro USB. After a few seconds you should be able to see a few lines of text on the screen. If that is not the case, recheck the connection to the display.



Note: Operation Without Mouse

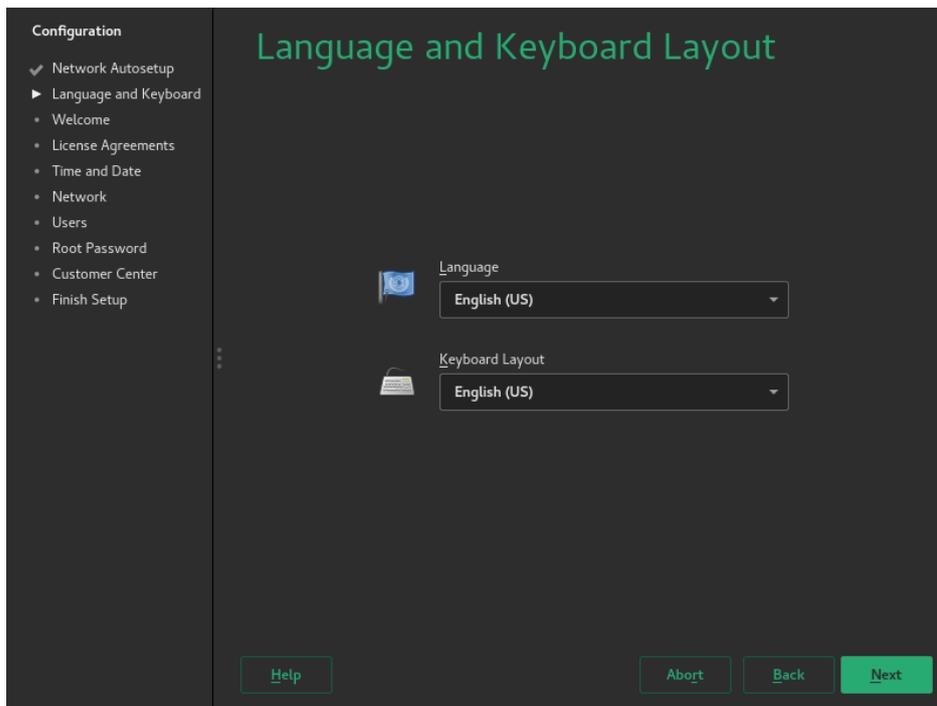
YaST can be used without a mouse by only using the keyboard. Every GUI element has an accelerator configured, visible as underlined letter. To activate such an accelerator, press the letter together with **Alt**.

On the first boot, the system will expand to fill the entire SD card, so be patient.

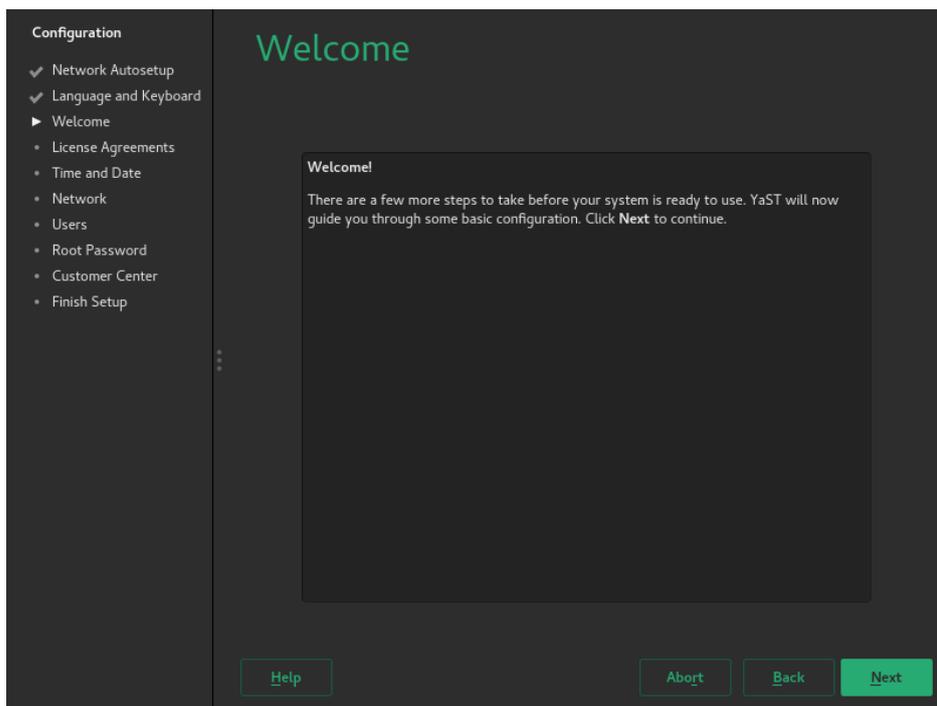
3.1 Initial System Setup with YaST

After a few minutes, YaST will lead you through the initial system setup.

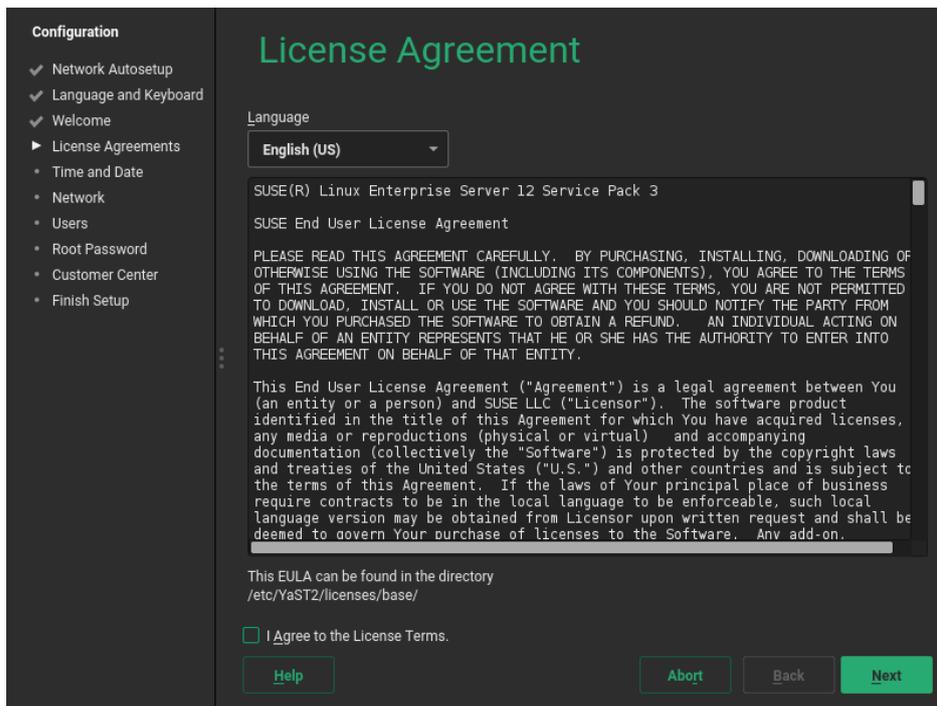
1. First, the system language and keyboard layout needs to be configured. Use the drop-down boxes and click *Next*.



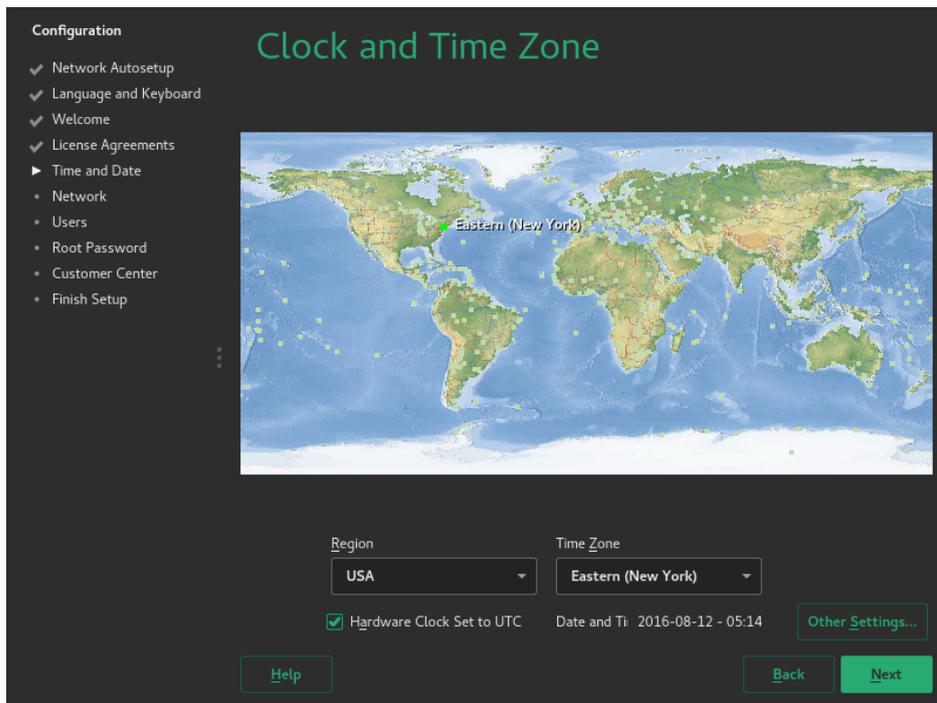
2. Select *Next* on this screen.



3. Read the License Agreement. You need to accept the license by selecting *I Agree to the License Terms* and choosing *Next*.

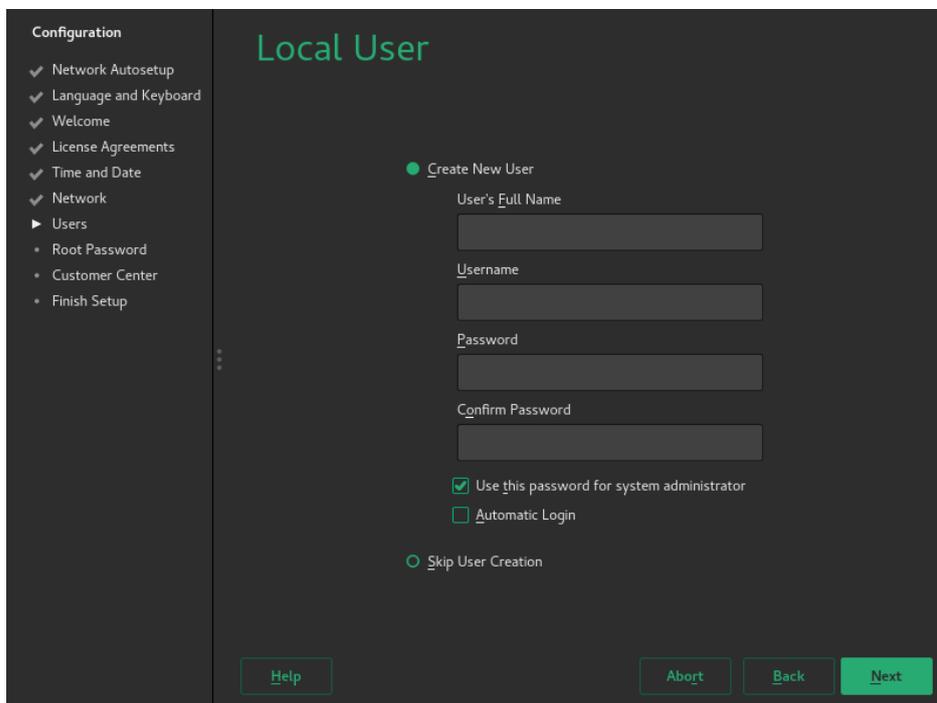


- Select the time zone either by clicking the area in the map or selecting region and zone in the drop-down boxes.



If the time and date shown at the bottom on the screen are incorrect, setup the Network Time Protocol client by following these steps:

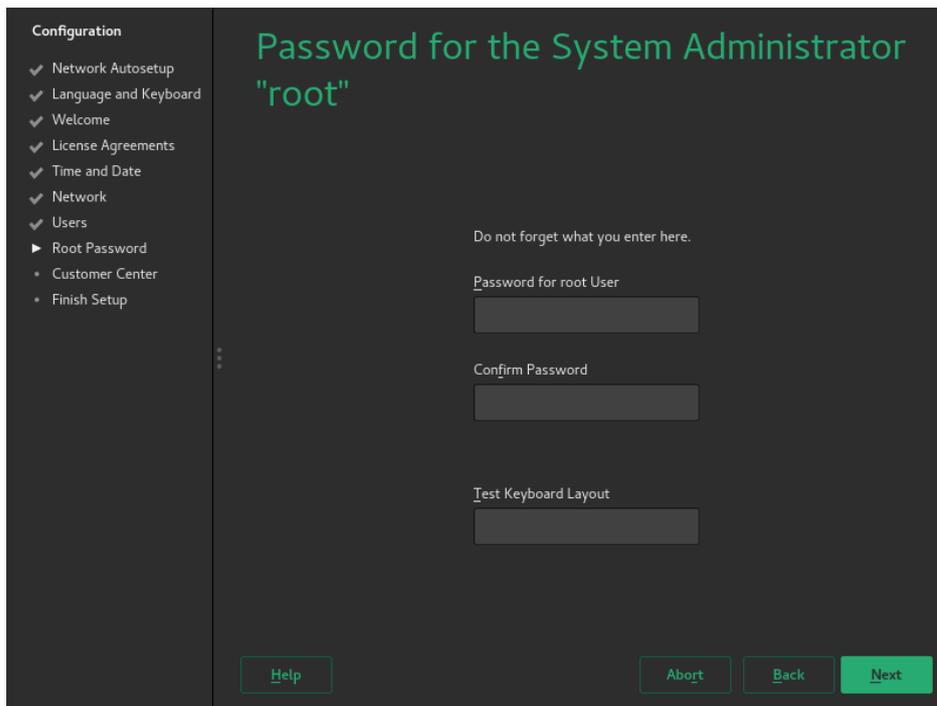
- a. Click *Other Settings* to open the NTPD configuration.
 - b. Click *Other Settings* to synchronize date and time with NTPD.
 - c. After the synchronization completed, click *Accept* to return to the Time and Date overview.
5. Click *Next* to proceed.
 6. On this page, you can configure a default user account.



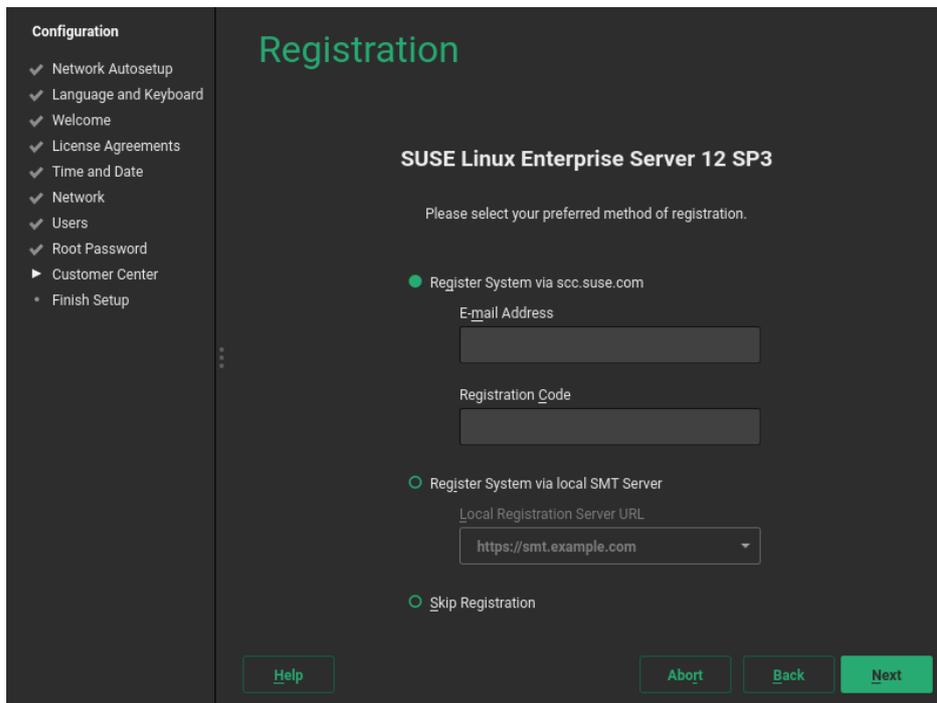
Note: Automatic Login not supported

Automatic Login is not supported by `xdm`, the default display manager. Install `gdm` after the installation to make it work.

7. If you chose to skip the previous step or if you chose not to set a root password, you will be asked to provide one now. Do not forget what you enter here, you will need it for administration!



8. On this screen you need to enter your E-mail address and the registration code you received. You can also choose to *Skip Registration*.



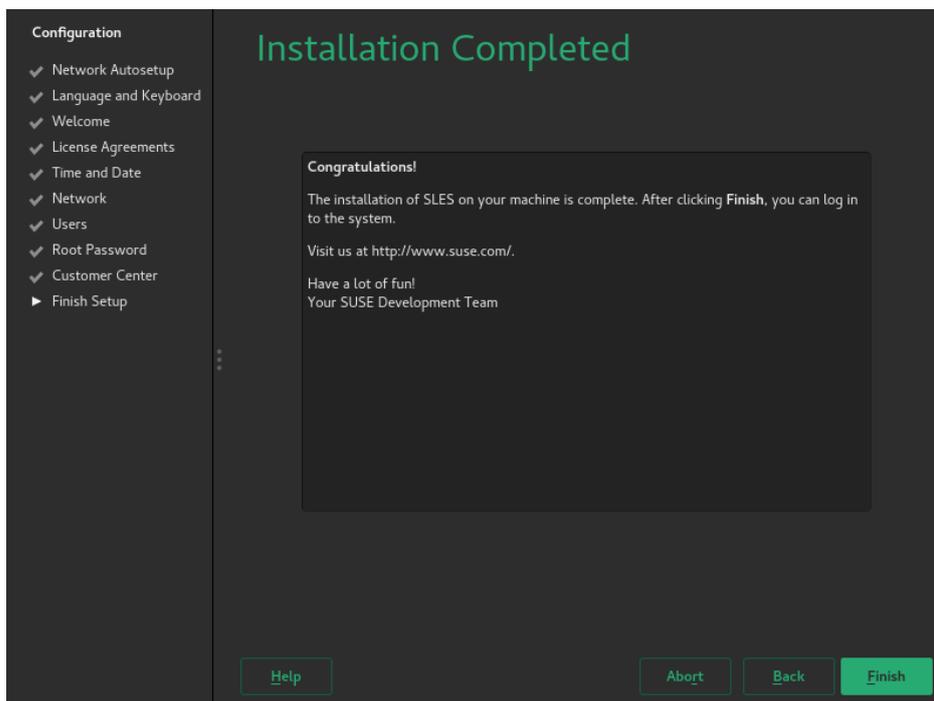


Note: Skipping the Registration

If you choose to skip the registration here, you will not receive updates or patches until you registered manually using YaST.

After successful registration you will be given the option to activate *Modules* as additional package repositories. For example the *Toolchain Module* provides the supported versions of the GNU Compiler Collection for SUSE Linux Enterprise Server for ARM 12 SP3.

9. Click *Finish* to exit the setup wizard and continue the system start-up.



3.2 The Desktop Environment

When the system finished booting, you will see the following login screen:

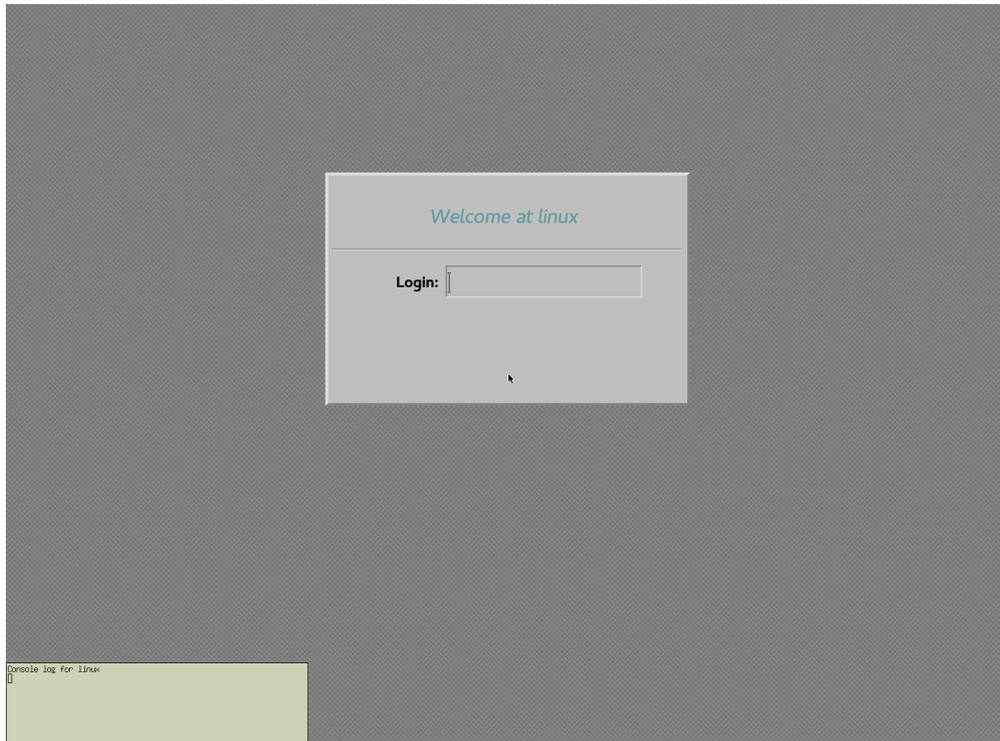


FIGURE 4: XDM LOGIN SCREEN

Type in the user name and password you chose during the initial configuration. The default IceWM desktop starts. By using the menu, you can start an XTerm terminal:

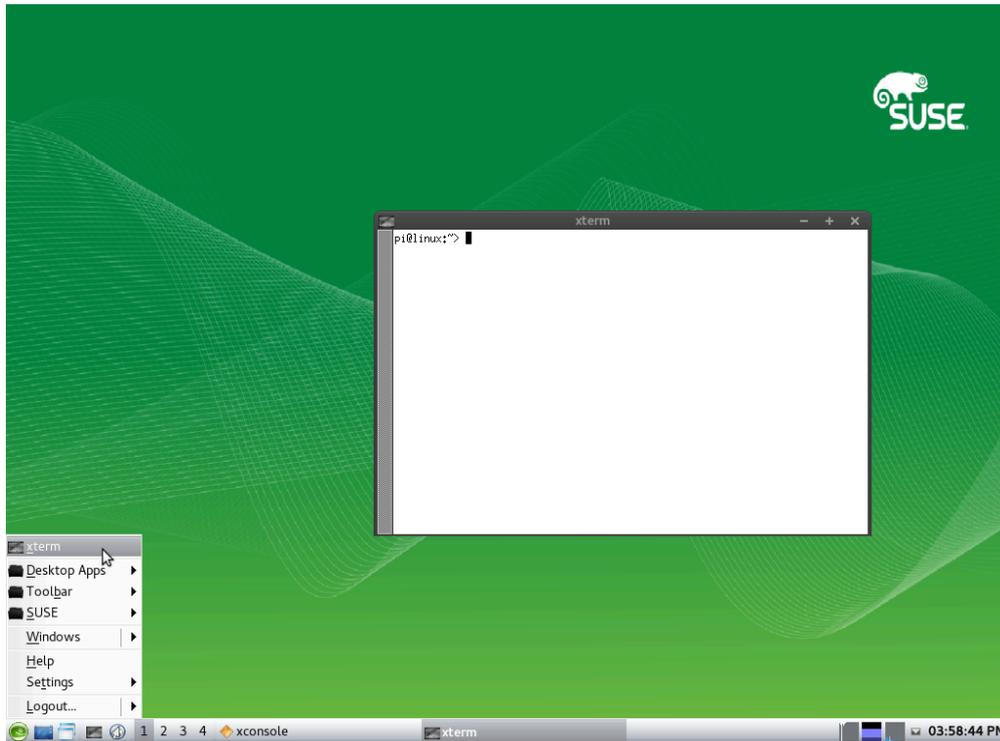


FIGURE 5: ICEWM DESKTOP

4 General System Usage

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

4.1 Bluetooth*

The Raspberry Pi has a Bluetooth* controller on-board that can be used for various purposes, like wireless keyboards, mice or audio devices.

To enable the Bluetooth* controller for use with bluetoothctl and related applications, run:

```
root # hciattach /dev/ttyAMA0 bcm43xx 921600
bcm43xx_init
Flash firmware /lib/firmware/BCM43430A1.hcd
Set Controller UART speed to 921600 bit/s
```

Device setup complete

You can then use `hciconfig hci0 up` to bring the device up and use `hcitool scan` to scan the environment for discoverable devices.

4.2 Compiler

For compiling software, only the versions of the GNU Compiler Collection provided by the Toolchain Module, which can be selected after registration, are supported. To use the supported version, `gcc-7` needs to be invoked instead of `gcc`.

5 Initial System Configuration

In this section it is explained how to perform the initial system configuration for SUSE Linux Enterprise Server for ARM 12 SP3 on the Raspberry Pi.

5.1 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 exited, you need to log out and in again.

5.2 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, consult the respective sections of the SUSE Linux Enterprise Server Deployment Guide and the SUSE Linux Enterprise Server Administration Guide at <https://documentation.suse.com/sles/12-SP3/>. To access these guides, download the compressed documentation folder.

5.3 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 x86, Power, IBM Z, or on other Arm-based systems.



Important: Setting the Clock

Because the 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 register your system either during first boot or via the *YaST Product Registration* module.



Note: Evaluation Code

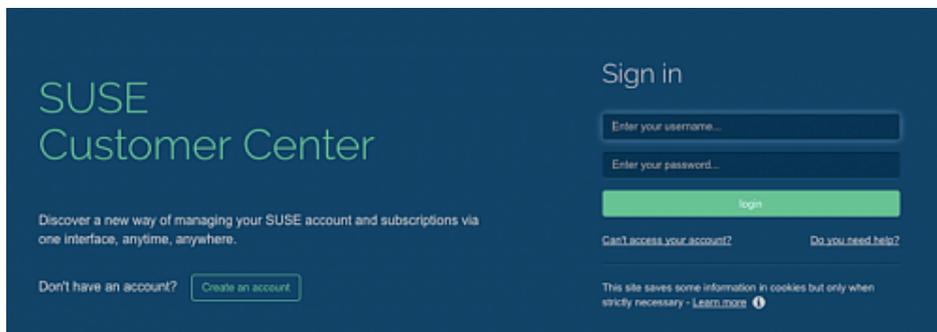
Sixty day evaluation subscriptions may be requested at the following page: <https://www.suse.com/products/arm/raspberry-pi/>

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

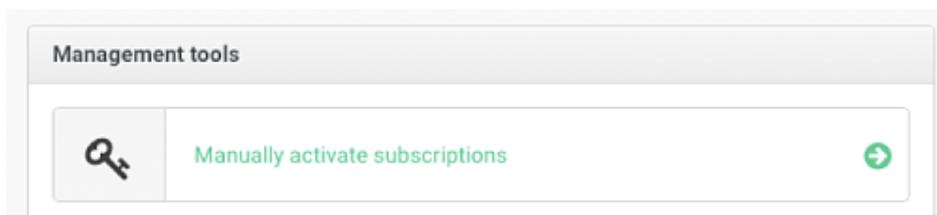
<https://scc.suse.com>

To register your subscription, perform the following steps:

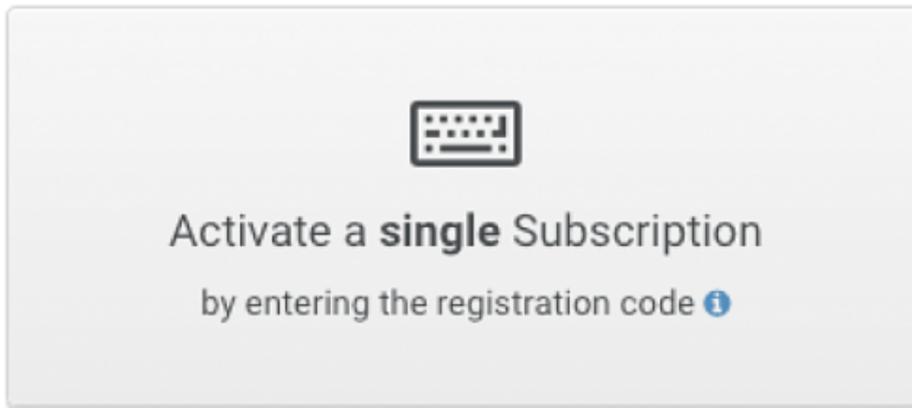
1. Log in to the SUSE Customer Center using a browser on another machine. Create an account if required:



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:

The form contains a text input field with the placeholder text "Enter a registration code...". Below the input field is a checkbox followed by the text "I accept the **terms and conditions**". At the bottom right of the form is a green button labeled "Manually Activate Subscription".

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

The screen displays the message: "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		0 of 1 714K7CH4N0Z00000

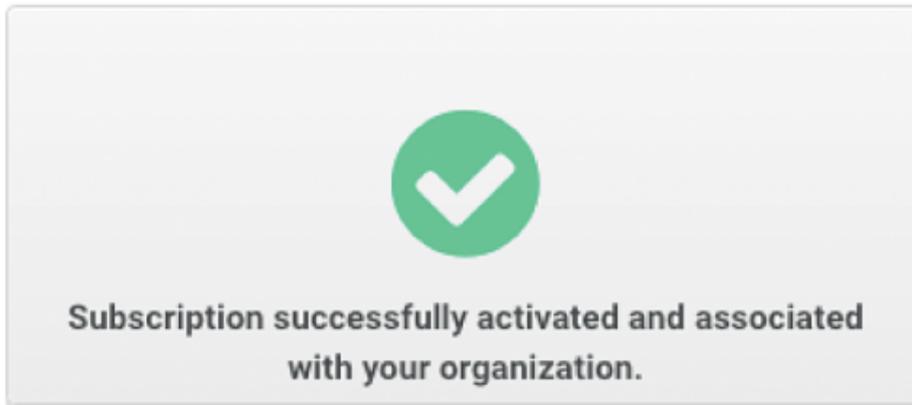
Please select an organization for the subscription:

My organizations

For Personal Use (UC2240116) ▾

✓ Activate

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



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 12 SP3 at <https://documentation.suse.com/sles-12>.



Note: Applicability of Product Documentation

Not all content in the product documentation applies to SUSE Linux Enterprise Server for ARM on the Raspberry Pi, because the Raspberry Pi differs largely 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/login> you can open an incident.

In addition, SUSE has provided conversation forums where you can get answers to questions. Go to <https://forums.suse.com/>. Under the main forum category **SUSE Linux Enterprise Server** select the sub-forum **SLES for Raspberry Pi**.

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