Deploying SUSE Linux Micro using Raw Disk Images on Virtual Machines

WHAT?

SUSE Linux Micro provides raw images—also referred to as *pre-built images*—that can be directly deployed to your virtual machine.

WHY?

Virtualized deployment saves hardware resources.

EFFORT

It takes approximately 20 minutes to read the article.

GOAL

SUSE Linux Micro is successfully deployed to a virtual machine.

REQUIREMENTS

- A VM Host Server with a `libvirt` and a KVM virtualization environment installed and running.
- Minimum of 32 GB of disk space for deployment of the image.
- Optionally, a configuration medium, for example, a USB flash disk.

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Contents

1 About pre-built images

Pre-built images are ready-to-use representations of a running operating system. They are not installed in a traditional way using an installer, but copied to the hard disk of the target host. The topic covers basic information about these pre-built images.

The pre-built images are intended to be configured on the first boot by using tools delivered in the images. The boot loader detects the first boot as described in *Section 1.2, "First boot detection"*. Each image comes with default mounted subvolumes, which may be changed during the first boot configuration. For details about the subvolumes, refer to *Section 1.1, "Default partitioning"*.

1.1 Default partitioning

The pre-built images are delivered with a default partitioning scheme. You can change it during the first boot by using *Ignition* or *Combustion*.

Important: Btrfs is mandatory for the root file system

If you intend to perform any changes to the default partitioning scheme, the root file system must be Btrfs.

Each image has the following subvolumes:

```
/home
/root
/opt
/srv
/usr/local
/var
```

The `/etc` directory is mounted as overlayFS, where the upper directory is mounted to `/var/lib/overlay/1/etc/`.

You can recognize the subvolumes mounted by default by the option `x-initrd.mount` in `/etc/fstab`. Other subvolumes or partitions must be configured either by Ignition or Combustion.

1.2 First boot detection

The deployment configuration runs on the first boot only. To distinguish between the first and subsequent boots, the flag file `/boot/writable/firstboot_happened` is created after the first boot finishes. If the file is not present in the file system, the attribute `ignition.firstboot` is passed to the kernel command line and thus both Ignition and Combustion are triggered to run (in the initrd). After completing the first boot, the `/boot/writable/firstboot_happened` flag file is created.

Note: The flag file is always created

Even though the configuration may not be successful because of improper or missing configuration files, the `/boot/writable/firstboot_happened` flag file is created.

1.2.1 Force system reconfiguration on a subsequent boot

If you need to reconfigure your system after the first boot happened, you can force the reconfiguration on the subsequent boot. Here you have two options.

- You can pass the `ignition.firstboot=1` attribute to the kernel command line.
- You can delete the flag file `/boot/writable/firstboot_happened`.

2 Preparing the configuration device

Important: SSH login

By default, `root` SSH login in SUSE Linux Micro is permitted only by using the SSH key. We recommend creating an unprivileged user during the deployment process that you can use to access the installed system. You can create an unprivileged user account on the first boot by using either the Combustion or Ignition tool. Creating an unprivileged user during system deployment is useful for accessing the Cockpit Web interface as well.

To prepare the configuration device, proceed as follows:

PROCEDURE 1: PREPARING THE CONFIGURATION DEVICE

1. Format the disk to any file system supported by SUSE Linux Micro: Ext3, Ext4, etc.:

```
> sudo mkfs.ext4 /dev/sdY
```

2. Set the device label to either `ignition` (when either Ignition or Combustion is used) or `combustion` (when only Combustion is used). If needed (for example, on Windows host), use uppercase letters for the labels. To label the device, run:

```
> sudo e2label /dev/sdY ignition
```

   You can use any type of configuration storage media that your virtualization system or your hardware supports: an ISO image, a USB flash disk, etc.

3. Mount the device:

```
> sudo mount /dev/sdY /mnt
```

4. Create the directory structure as mentioned in *Section 2.1.1.1, "`config.ign`"* or *Section 2.2, "Configuring SUSE Linux Micro deployment with Combustion"*, depending on the configuration tool used:

```
> sudo mkdir  /mnt/ignition/
```

   or:

```
> sudo mkdir -p /mnt/combustion/
```

5. Prepare all elements of the configuration that will be used by *Ignition* or *Combustion*.

2.1 Configuring SUSE Linux Micro deployment with Ignition

Ignition (https://coreos.github.io/ignition/) is a provisioning tool that enables you to configure a system according to your specification on the first boot.

2.1.1 How does Ignition work?

When the system is booted for the first time, Ignition is loaded as part of an `initramfs` and searches for a configuration file within a specific directory (on a USB flash disk, or you can provide a URL). All changes are performed before the kernel switches from the temporary file system to the real root file system (before the `switch_root` command is issued).

Ignition uses a configuration file in the JSON format named `config.ign`. You can either write the configuration manually or use the Fuel Ignition Web application at https://ignite.opensuse.org to generate it.

Important

Fuel Ignition does not cover the complete Ignition vocabulary yet, and the resulting JSON file may need additional manual tweaking.

2.1.1.1 `config.ign`

The configuration file `config.ign` must reside in the `ignition` subdirectory on the configuration media, for example, a USB stick labeled `ignition`. The directory structure must look as follows:

```
<root directory>
└── ignition
    └── config.ign
```

Tip

To create a disk image with the Ignition configuration, you can use the Fuel Ignition Web application at https://ignite.opensuse.org.

The `config.ign` contains multiple data types: objects, strings, integers, booleans and lists of objects. For a complete specification, refer to Ignition specification v3.3.0 (https://coreos.github.io/ignition/configuration-v3_3/).

The `version` attribute is mandatory and in case of SUSE Linux Micro, its value must be set either to `3.3.0` or to any lower version. Otherwise, Ignition will fail.

To log in to your system as `root`, you must at least include a password for `root`. However, it is recommended to establish access via SSH keys. To configure a password, make sure to use a secure one. If you use a randomly generated password, use at least 10 characters. If you create your password manually, use even more than 10 characters and combine uppercase and lowercase letters and numbers.

2.1.2 Ignition configuration examples

2.1.2.1 Configuration examples

This section provides several examples of the Ignition configuration in the built-in JSON format.

Important

Section 1.1, "Default partitioning" lists subvolumes that are mounted by default when running the pre-built image. If you want to add a new user or modify any of the files on a subvolume that is not mounted by default, you need to declare such subvolume first so that it is mounted as well. Find more details about mounting file systems in *Section 2.1.2.1.1.3, "The `filesystems` attribute"*.

Note: The `version` attribute is mandatory

Each `config.fcc` must include version 1.4.0 or lower that is then converted to the corresponding Ignition specification.

2.1.2.1.1 Storage configuration

The `storage` attribute is used to configure partitions, RAID, define file systems, create files, etc. To define partitions, use the `disks` attribute. The `filesystems` attribute is used to format partitions and define mount points of particular partitions. The `files` attribute can be used to create files in the file system. Each of the mentioned attributes is described in the following sections.

2.1.2.1.1.1 The `disks` attribute

The `disks` attribute is a list of devices that enables you to define partitions on these devices. The `disks` attribute must contain at least one `device`, other attributes are optional. The following example uses a single virtual device and divides the disk into four partitions:

```
{
  "ignition": {
    "version": "3.0.0"
  },
  "storage": {
    "disks": [
      {
        "device": "/dev/vda",
        "partitions": [
          {
            "label": "root",
            "number": 1,
            "typeGuid": "4F68BCE3-E8CD-4DB1-96E7-FBCAF984B709"
          },
          {
            "label": "boot",
            "number": 2,
            "typeGuid": "BC13C2FF-59E6-4262-A352-B275FD6F7172"
          },
          {
            "label": "swap",
            "number": 3,
            "typeGuid": "0657FD6D-A4AB-43C4-84E5-0933C84B4F4F"
          },
          {
            "label": "home",
            "number": 4,
            "typeGuid": "933AC7E1-2EB4-4F13-B844-0E14E2AEF915"
          }
        ],
        "wipeTable": true
      }
    ]
  }
}
```

2.1.2.1.1.2 The `raid` attribute

The `raid` is a list of RAID arrays. The following attributes of `raid` are mandatory:

level

a level of the particular RAID array (linear, raid0, raid1, raid2, raid3, raid4, raid5, raid6)

devices

a list of devices in the array referenced by their absolute paths

name

a name that will be used for the md device

For example:

```
{
  "ignition": {
    "version": "3.0.0"
  },
  "storage": {
    "raid": [
      {
        "devices": [
          "/dev/sda",
          "/dev/sdb"
        ],
        "level": "raid1",
        "name": "system"
      }
    ]
  }
}
```

2.1.2.1.1.3 The `filesystems` attribute

`filesystems` must contain the following attributes:

device

the absolute path to the device, typically `/dev/sda` in case of physical disk

format

the file system format (Btrfs, Ext4, xfs, vfat or swap)

Note

In case of SUSE Linux Micro, the `root` file system must be formatted to Btrfs.

The following example demonstrates using the `filesystems` attribute. The `/opt` directory will be mounted to the `/dev/sda1` partition, which is formatted to Btrfs. The device will not be erased.

For example:

```
{
  "ignition": {
    "version": "3.0.0"
  },
  "storage": {
    "filesystems": [
      {
        "device": "/dev/sda1",
        "format": "btrfs",
        "path": "/opt",
        "wipeFilesystem": false
      }
    ]
  }
}
```

Normally, a regular user's home directory is located in the `/home/USER_NAME` directory. Since `/home` is not mounted by default in the initrd, the mount has to be explicitly defined for the user creation to succeed:

```
{
  "ignition": {
    "version": "3.1.0"
  },
  "passwd": {
    "users": [
      {
        "name": "root",
        "passwordHash": "PASSWORD_HASH",
        "sshAuthorizedKeys": [
          "ssh-rsa SSH_KEY_HASH"
        ]
      }
    ]
  },
```

```
  "storage": {
    "filesystems": [
      {
        "device": "/dev/sda3",
        "format": "btrfs",
        "mountOptions": [
          "subvol=/@/home"
        ],
        "path": "/home",
        "wipeFilesystem": false
      }
    ]
  }
}
```

2.1.2.1.1.4 The `files` attribute

You can use the `files` attribute to create any files on your machine. Bear in mind that to create files outside the default partitioning schema, you need to define the directories by using the `filesystems` attribute.

In the following example, a host name is created by using the `files` attribute. The file `/etc/hostname` will be created with the *sl-micro1* host name:

Important

Keep in mind that JSON accepts file modes in decimal numbers, for example, `420`.

JSON:

```
{
  "ignition": {
    "version": "3.0.0"
  },
  "storage": {
    "files": [
      {
        "overwrite": true,
        "path": "/etc/hostname",
        "contents": {
          "source": "data:,sl-micro1"
        },
        "mode": 420
      }
```

```
    ]
  }
}
```

2.1.2.1.1.5 The `directories` attribute

The `directories` attribute is a list of directories that will be created in the file system. The `directories` attribute must contain at least one `path` attribute.

For example:

```
{
  "ignition": {
    "version": "3.0.0"
  },
  "storage": {
    "directories": [
      {
        "path": "/home/tux",
        "user": {
          "name": "tux"
        }
      }
    ]
  }
}
```

2.1.2.1.2 Users administration

The `passwd` attribute is used to add users. As some services, such as Cockpit, require login using a non-root user, define at least one unprivileged user here. Alternatively, you can create such a user from a running system as described in *Section 5.3, "Adding users"*.

To log in to your system, create `root` and a regular user and set their passwords. You need to hash the passwords, for example, by using the **`openssl`** command:

```
openssl passwd -6
```

The command creates a hash of the password you chose. Use this hash as the value of the `password_hash` attribute.

For example:

```
{
  "ignition": {
```

```
    "version": "3.0.0"
  },
  "passwd": {
    "users": [
      {
        "name": "root",
        "passwordHash": "PASSWORD_HASH",
        "sshAuthorizedKeys": [
          "ssh-rsa SSH_KEY_HASH USER@HOST"
        ]
      }
    ]
  }
}
```

The `users` attribute must contain at least one `name` attribute. `ssh_authorized_keys` is a list of ssh keys for the user.

2.1.2.1.3 Enabling `systemd` services

You can enable `systemd` services by specifying them in the `systemd` attribute.

For example:

```
{
  "ignition": {
    "version": "3.0.0"
  },
  "systemd": {
    "units": [
      {
        "enabled": true,
        "name": "sshd.service"
      }
    ]
  }
}
```

2.2 Configuring SUSE Linux Micro deployment with Combustion

Combustion is a dracut module that enables you to configure your system on the first boot. You can use Combustion, for example, to change the default partitions, set user passwords, create files, or install packages.

2.2.1 How does Combustion work?

Combustion is invoked after the `ignition.firstboot` argument is passed to the kernel command line. Combustion reads a provided file named `script`, executes included commands, and thus performs changes to the file system. If `script` includes the network flag, Combustion tries to configure the network. After `/sysroot` is mounted, Combustion tries to activate all mount points in `/etc/fstab` and then calls **`transactional-update`** to apply other changes, for example, setting `root` password or installing packages.

The configuration file `script` must reside in the `combustion` subdirectory on the configuration media labeled `combustion`. The directory structure must look as follows:

```
<root directory>
└── combustion
    └── script
    └── other files
```

Tip: Using Combustion together with Ignition

Combustion can be used along with Ignition. If you intend to do so, label your configuration medium `ignition` and include the `ignition` directory with the `config.ign` to your directory structure as shown below:

```
<root directory>
└── combustion
    └── script
    └── other files
└── ignition
    └── config.ign
```

In this scenario, Ignition runs before Combustion.

2.2.2 Combustion configuration examples

2.2.2.1 The `script` configuration file

The `script` configuration file is a set of commands that are parsed and executed by Combustion in a **`transactional-update`** shell. This article provides examples of configuration tasks performed by Combustion.

Important: Include interpreter declaration

As the `script` file is interpreted by the shell, always start the file with the interpreter declaration on its first line. For example, in case of Bash:

```
#!/bin/bash
```

To log in to your system, include at least the `root` password. However, it is recommended to establish the authentication using SSH keys. If you need to use a `root` password, make sure to configure a secure password. For a randomly generated password, use at least 10 characters. If you create your password manually, use even more than 10 characters and combine uppercase and lowercase letters and numbers.

2.2.2.1.1 Network configuration

To configure and use the network connection during the first boot, add the following statement to `script`:

```
# combustion: network
```

Using this statement passes the `rd.neednet=1` argument to dracut. The network configuration defaults to using DHCP. If a different network configuration is needed, proceed as described in *Section 2.2.2.1.2, "Performing modifications in the initramfs"*.

If you do not use the statement, the system remains configured without any network connection.

2.2.2.1.2 Performing modifications in the initramfs

You may need to perform changes to the initramfs environment, for example, to write a custom network configuration for NetworkManager into `/etc/NetworkManager/system-connections/`. To do so, use the `prepare` statement.

For example, to create a connection with a static IP address and configure DNS:

```
#!/bin/bash
# combustion: network prepare
set -euxo pipefail

nm_config() {
  umask 077 # Required for NM config
  mkdir -p /etc/NetworkManager/system-connections/
```

```
  cat >/etc/NetworkManager/system-connections/static.nmconnection <<-EOF
  [connection]
  id=static
  type=ethernet
  autoconnect=true

  [ipv4]
  method=manual
  dns=192.168.100.1
  address1=192.168.100.42/24,192.168.100.1
EOF
}

if [ "${1-}" = "--prepare" ]; then
  nm_config # Configure NM in the initrd
  exit 0
fi

# Redirect output to the console
exec > >(exec tee -a /dev/tty0) 2>&1

  nm_config # Configure NM in the system
  curl example.com
# Leave a marker
echo "Configured with combustion" > /etc/issue.d/combustion
```

2.2.2.1.3 Partitioning

SUSE Linux Micro raw images are delivered with a default partitioning scheme as described in *Section 1.1, "Default partitioning"*. You might want to use a different partitioning. The following set of example snippets moves the `/home` to a different partition.

Note: Performing changes outside of directories included in snapshots

The following script performs changes that are not included in snapshots. If the script fails and the snapshot is discarded, certain changes remain visible and cannot be reverted, for example, the changes to the `/dev/vdb` device.

The following snippet creates a GPT partitioning schema with a single partition on the `/dev/vdb` device:

```
sfdisk /dev/vdb <<EOF
```

```
label: gpt
type=linux
EOF

partition=/dev/vdb1
```

The partition is formatted to Btrfs:

```
wipefs --all ${partition}
mkfs.btrfs ${partition}
```

Possible content of `/home` is moved to the new `/home` folder location by the following snippet:

```
mount /home
mount ${partition} /mnt
rsync -aAXP /home/ /mnt/
umount /home /mnt
```

The snippet below removes an old entry in `/etc/fstab` and creates a new entry:

```
awk -i inplace '$2 != "/home"' /etc/fstab
echo "$(blkid -o export ${partition} | grep ^UUID=) /home btrfs defaults 0 0" >>/etc/
fstab
```

2.2.2.1.4 Creating new users

As some services, such as Cockpit, require login using a non-root user, define at least one unprivileged user here. Alternatively, you can create such a user from a running system as described in *Section 5.3, "Adding users"*.

To add a new user account, first create a hash string that represents the user's password. Use the **`openssl passwd -6`** command.

After you obtain the password hash, add the following lines to the `script`:

```
mount /home
useradd -m EXAMPLE_USER
echo 'EXAMPLE_USER:PASSWORD_HASH' | chpasswd -e
```

2.2.2.1.5 Setting a password for `root`

Before you set the `root` password, generate a hash of the password, for example, by using the **`openssl passwd -6`**. To set the password, add the following line to the `script`:

```
echo 'root:PASSWORD_HASH' | chpasswd -e
```

2.2.2.1.6 Adding SSH keys

The following snippet creates a directory to store the `root`'s SSH key and then copies the public SSH key located on the configuration device to the `authorized_keys` file.

```
mkdir -pm700 /root/.ssh/
cat id_rsa_new.pub >> /root/.ssh/authorized_keys
```

Note

The SSH service must be enabled in case you need to use remote login via SSH. For details, refer to *Section 2.2.2.1.7, "Enabling services"*.

2.2.2.1.7 Enabling services

To enable system services, for example, the SSH service, add the following line to `script`:

```
systemctl enable sshd.service
```

2.2.2.1.8 Installing packages

Important: Network connection and registering your system may be necessary

As certain packages may require additional subscription, you may need to register your system beforehand. An available network connection may also be needed to install additional packages.

During the first boot configuration, you can install additional packages to your system. For example, you can install the `vim` editor by adding:

```
zypper --non-interactive install vim-small
```

Note

Bear in mind that you will not be able to use **`zypper`** after the configuration is complete and you boot to the configured system. To perform changes later, you must use the **`transactional-update`** command to create a changed snapshot.

3 Preparing the virtual machine

This section describes how to prepare a new virtual machine and what steps to take to deploy SUSE Linux Micro on that machine.

1. Download the SUSE Linux Micro disk image on the VM Host Server where you intend to run virtualized SUSE Linux Micro.
2. Start Virtual Machine Manager and select *File* › *New Virtual Machine*.
3. Select *Import existing disk image*. Confirm with *Forward*.
4. Specify the path to the SUSE Linux Micro disk image that you previously downloaded and the type of Linux OS you are deploying, for example, `Generic Linux 2020`. Confirm with *Forward*.
5. Specify the amount of memory and number of processors that you want to assign to the SUSE Linux Micro virtual machine and confirm with *Forward*.
6. Specify the name for the virtual machine and the network to be used.
7. If you are deploying an encrypted SUSE Linux Micro image, perform these additional steps:
    a. Enable *Customize configuration before install* and confirm with *Finish*.
    b. Click *Overview* from the left menu and change the boot method from BIOS to UEFI for secure boot. Confirm with *Apply*.

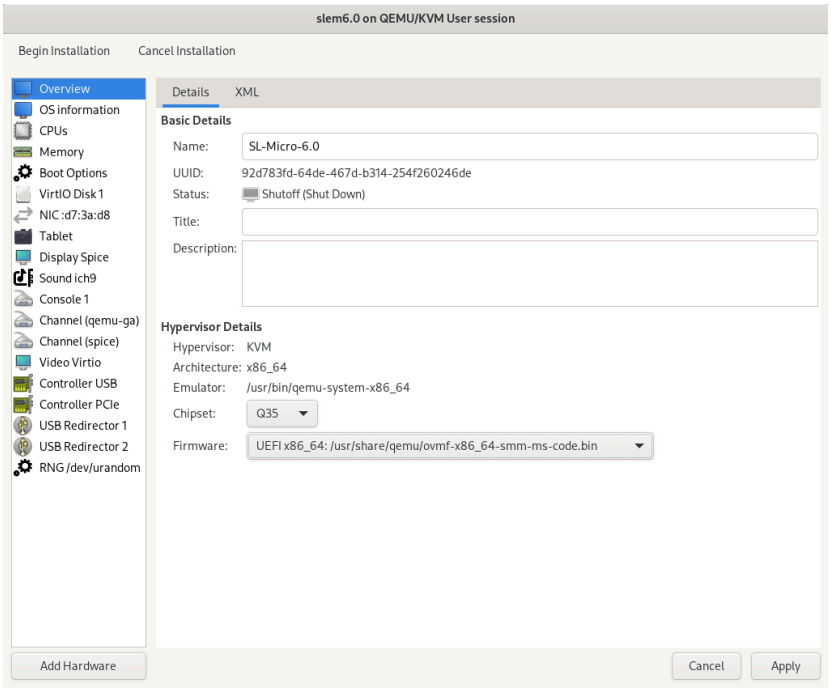

FIGURE 1: SET UEFI FIRMWARE FOR THE ENCRYPTED SUSE LINUX MICRO IMAGE

c. Add a Trusted Platform Module (TPM) device. Click *Add Hardware*, select *TPM* from the left menu, and select the *Emulated* type.

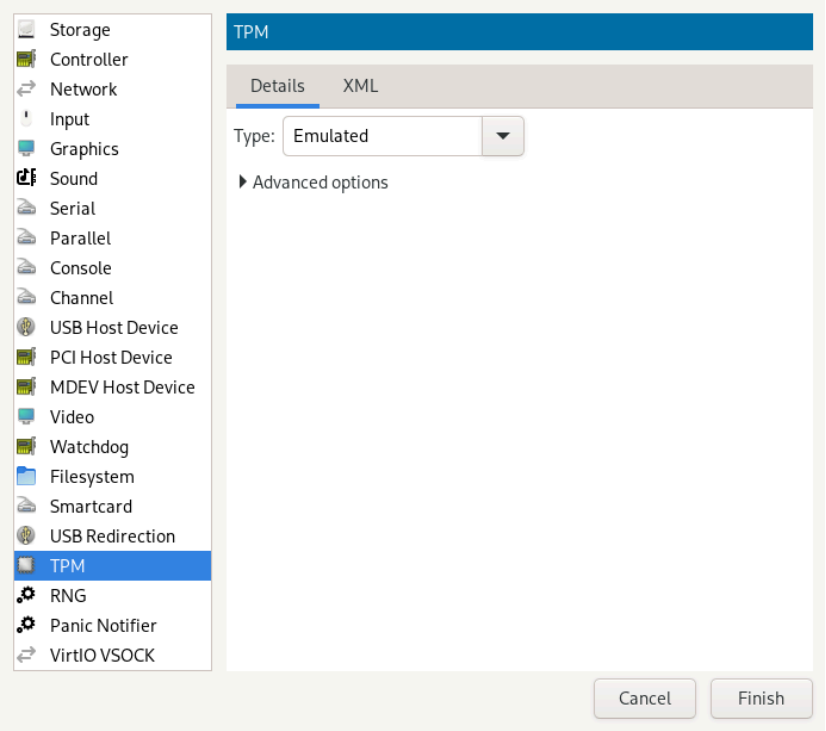

FIGURE 2: ADD AN EMULATED TPM DEVICE

Confirm with *Finish* and start the SUSE Linux Micro deployment by clicking *Begin Installation* from the top menu.

4 Configuring with JeOS Firstboot

When booting SUSE Linux Micro for the first time without providing any configuration device, *JeOS Firstboot* enables you to perform a minimal configuration of your system. If you need more control over the deployment process, use a configuration device with either Ignition or Combustion configuration. Find more information in *Section 2.1, "Configuring SUSE Linux Micro deployment with Ignition"* and *Section 2.2, "Configuring SUSE Linux Micro deployment with Combustion"*.

To configure the system with *JeOS Firstboot*, proceed as follows:

1. *JeOS Firstboot* displays a welcome screen. Confirm with `Enter`.
2. On the next screens, select keyboard, confirm the license agreement and select the time zone.

3. In the *Enter root password* dialog window, enter a password for the `root` and confirm it.

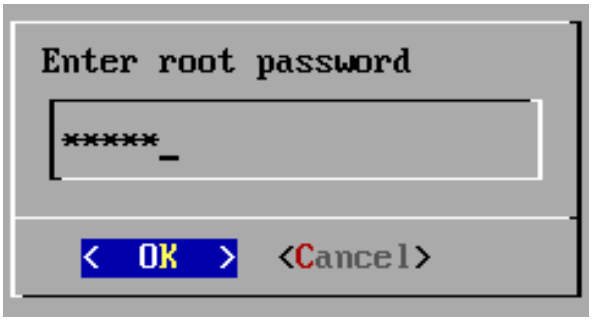

FIGURE 3: ENTER ROOT PASSWORD

4. For encrypted deployments, JeOS Firstboot does the following:

   - Asks for a new passphrase that replaces the default passphrase.
   - Generates a new LUKS key and re-encrypts the partition.
   - Adds a secondary key slot to the LUKS header and seals it against the TPM device.

   If you are deploying an encrypted image, follow these steps:

   a. Select the desired protection method and confirm with *OK*.

   b. Enter a recovery password for LUKS encryption and retype it. The root file system re-encryption begins.

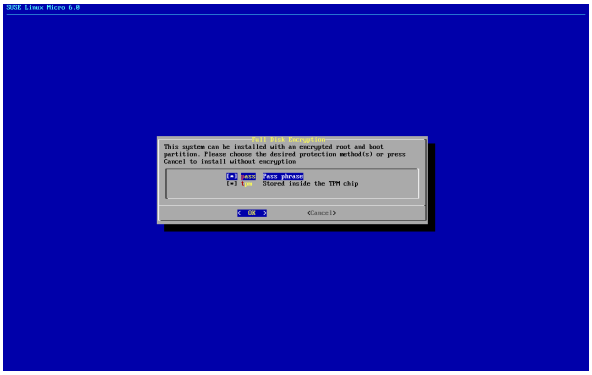

FIGURE 4: SELECT METHOD FOR ENCRYPTION

5. After successful deployment, register your system and create an unprivileged user as described in *Section 5.4, "Registering SUSE Linux Micro from CLI"*.

5 Post deployment steps

5.1 Expanding encrypted disk images

Encrypted raw disk images of SUSE Linux Micro do not expand to the full disk capacity automatically. This procedure outlines steps to expand them to a desired size.

PROCEDURE 2: EXPANDING ENCRYPTED DISK IMAGES

1. Use the **qemu-img** command to increase the disk image to the desired size.
2. Use the **parted** command to resize the partition where the LUKS device resides (for example, partition number 3) to the desired size.
3. Run the **cryptsetup resize luks** command. When asked, enter the passphrase to resize the encrypted device.
4. Run the **transactional-update shell** command to open a read-write shell in the current disk snapshot. Then resize the Btrfs file system to the desired size, for example:

   ```
   # btrfs fi resize max /
   ```

5. Leave the shell with **exit** and reboot the system with **reboot**.

5.2 Reencrypting the encrypted system

Warning: The system is not secured

The system is not secured. Thus, do not store any sensitive data in it until the disk reencryption is complete.

Note: The step is not needed if you deployed your system using JeOS Firstboot

JeOS Firstboot prompts for a new passphrase during the deployment phase. After you enter it, the system is reencrypted automatically, thus no further action is needed.

SUSE Linux Micro encrypted images are delivered with a default LUKS passphrase. To secure your system, make sure that you change it after the system is deployed. To do so, proceed as described below. Perform the steps in the same shell session.

1. Import the needed functions to your shell:

```
# source /usr/share/fde/luks
```

2. Identify the underlying LUKS device and define further used variables:

```
# luks_name=$(expr "`df --output=source / | grep /dev/`" :
      ".*/\(.*\)")
```

   and:

```
# luks_dev=$(luks_get_underlying_device "$luks_name")
```

3. Create a key file that stores the default passphrase *1234* and a key file with the new passphrase.

4. Change the recovery password:

```
# cryptsetup luksChangeKey --key-file PATH_TO_DEFAULT --pbkdf pbkdf2
 "${luks_dev}" PATH_TO_NEW
```

   PATH_TO_DEFAULT is a path to the key file with the default passphrase. *PATH_TO_NEW* is a path to the key file with your new passphrase.

5. Reencrypt the LUKS device:

```
# cryptsetup reencrypt --key-file PATH_TO_NEW ${luks_dev}
```

6. Create a new random key and seal it with TPM:

```
> sudo fdectl regenerate-key --passfile PATH_TO_NEW
```

7. Remove both key files you created in *Step 3*.

8. Update the `grub.cfg` file by running:

```
> sudo transactional-update grub.cfg
```

9. Reboot the system.

5.3 Adding users

As SUSE Linux Micro requires having a non-privileged user to log in via SSH or to access Cockpit, you need to create such an account.

This step is optional if you have defined an unprivileged user in the Ignition or Combustion. If you deployed your system using JeOS Firstboot, then you set up only the `root` password and you need to create the unprivileged account manually, as described below:

1. Run the **`useradd`** command as follows:

```
#
useradd -m USER_NAME
```

2. Set a password for that account:

```
# passwd USER_NAME
```

3. If needed, add the user to the `wheel` group:

```
# usermod -aG wheel USER_NAME
```

5.4 Registering SUSE Linux Micro from CLI

After successful deployment, you need to register the system to get technical support and receive updates. Registering the system is possible from the command line using the **`transactional-update register`** command.

To register SUSE Linux Micro with SUSE Customer Center, proceed as follows:

1. Run **`transactional-update register`** as follows:

```
# transactional-update register -r REGISTRATION_CODE -e EMAIL_ADDRESS
```

   To register with a local registration server, additionally provide the URL to the server:

```
# transactional-update register -r REGISTRATION_CODE -e EMAIL_ADDRESS \
 --url "https://suse_register.example.com/"
```

   Replace *`REGISTRATION_CODE`* with the registration code you received with your copy of SUSE Linux Micro. Replace *`EMAIL_ADDRESS`* with the e-mail address associated with the SUSE account you or your organization uses to manage subscriptions.

2. Reboot your system to switch to the latest snapshot.
3. SUSE Linux Micro is now registered.

Note: Other registration options

For information that goes beyond the scope of this section, refer to the inline documentation with `SUSEConnect --help`.

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