



# Performing Major Version Upgrades of SUSE Linux Enterprise When Standard Boot Options Are Unavailable

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SUSE Linux Enterprise 11 and newer

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This guide shows how to perform an upgrade of a SUSE Linux Enterprise system to a new major version in environments which do not allow for standard booting of the installation, neither via the local boot media, nor via PXE boot.

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# 1 Introduction

To upgrade your SUSE Linux Enterprise system to a newer service pack, there are tools available which allow for an online upgrade of the system. This means that new packages are installed while the system is running. After the installation of the packages, a reboot is necessary.

This process has the advantage that you only need access to the system, be it a local console or an SSH session. You do not need to configure the firmware to boot a different media.

However, upgrading a system to a new *major* version cannot be performed online. To perform an upgrade, you need to boot the system from the installation media (DVD, USB stick), or start it via PXE boot.

In some environments, it is not possible to insert a new media to the server, configure the firmware to boot from a different or even a virtual disk, or prepare the PXE boot environment for starting the upgrade process. This can be the case for example in clouds or in remote server rooms.

This document describes how the existing boot loader can be used in such environments to perform an upgrade from SUSE Linux Enterprise 11 to SUSE Linux Enterprise 12, or from SUSE Linux Enterprise 12 to SUSE Linux Enterprise 15.

While the examples below focus on the AMD64 or Intel 64 system architecture, a similar approach can be applied to other architectures too.

## 2 Terminology

The *Installation Media* is the media you use to boot the installation. It can be either a physical DVD or USB stick, an ISO image attached to a virtual machine, or the content on such media available via a network share.

For SUSE Linux Enterprise 12 products, the installation medium is the first DVD of the respective product. For SUSE Linux Enterprise 15 products, it is the unified installer DVD.

The *Installation Repository* contains packages for installation and metadata. It is included in the installation media. Online repositories, which are for example mirrored on the Subscription Management Tool (SMT), can serve the same purpose.

The *Installation System* is the environment which contains all tools that are needed to perform the installation (including for example YaST). It is also available from the installation media.

## 3 Requirements

To perform an upgrade, you need to have prepared the following components:

- The installation repository and installation system
- The installation kernel and `initrd`

The installation repository should be either copied to a local disk, or made available via the network. The installer supports all common transfer protocols, like HTTP(S), FTP, NFS, SMB. For local media, it supports a local disk or a CD/DVD drive. It is recommended to copy the entire content of the installation media, so that the installation system is included. The required disk space is approximately 5 GB for upgrading to SUSE Linux Enterprise 12, and approximately 1 GB for upgrading to SUSE Linux Enterprise 15, on top of the disk space needed for the upgrade itself. The installation kernel and `initrd` must be made available in the boot area of the respective hardware architecture. For example, for legacy booting of AMD64 or Intel 64 systems, this is the `/boot` directory. The required disk space is approximately 100 MB.

## 4 Preparing the Installation Repository

Preparing the installation repository is an easy task. Extract the content of the installation media to the respective location either on your local system or on a network share. Use the content of DVD1 of any SUSE Linux Enterprise 12 product, or the Installer DVD of the unified SUSE Linux Enterprise 15 installer.

If you intend to put the installation media to a local storage, either use a second disk or a stand-alone partition, which is not mounted by your system by default. The reason behind is that YaST mounts all partitions during the upgrade process. This would result in the partition being mounted twice at the same time.

If you use a network share, make sure that it is accessible from the host you aim to upgrade. You can test this for example via a Web browser.

If you use the installation media, copy its entire content to ensure it includes the installation system.

If you have a local Subscription Management Tool (SMT) or Repository Mirroring Tool (RMT) server available, the repository may already be mirrored on that server. If this is the case, point the installer to the POOL repository of the product you want to upgrade to. Ensure that the installation system is available too.

## 5 Preparing the Installation Kernel and Initrd

To boot the installer, you need to extract the installation kernel and `initrd` from the media and put it to the location where the boot loader can load it from. There are two ways to obtain the installation kernel and `initrd`:

- From the DVD1 of the SUSE Linux Enterprise 12-based product, respective the SUSE Linux Enterprise 15 unified installer
- From packages shipped with a new product for network booting

The examples below require as system architecture AMD64 or Intel 64 with legacy booting, and as product SUSE Linux Enterprise Server. For other products or architectures, the paths or package names may differ.

### 5.1 Extracting the Installation Kernel from the Media

The examples and explanations in this section require that the installation media is mounted under `/mnt`.

Copy the kernel and `initrd` from the installation media to the same location where your system stores its kernel and `initrd`:

```
# cp /mnt/boot/x86_64/loader/initrd /boot/initrd.install
# cp /mnt/boot/x86_64/loader/linux /boot/linux.install
```

### 5.2 Extracting the Installation Kernel from a Package

SUSE Linux Enterprise 12 SP4-based products and newer product versions include a package which contains all files needed for setting up a PXE boot server for installation of the respective product. The name of the package looks like the following example: `tftpboot-installation-<product>-<version>-<architecture>.noarch.rpm`. Download the package from the repositories of the product you install to. The package is architecture-independent and does not require any packages from the new product.

```
# rpm -i tftpboot-installation-SLES-12-SP4-x86_64-14.337.5-1.33.noarch.rpm
# cp /srv/tftpboot/SLES-12-SP4-x86_64/boot/x86_64/loader/linux /boot/linux.install
# cp /srv/tftpboot/SLES-12-SP4-x86_64/boot/x86_64/loader/initrd /boot/initrd.install
```

```
# rpm -e tftboot-installation-SLES-12-SP4-x86_64
```

## 6 Configuring the Boot Loader

To perform the upgrade, you need to configure the boot loader of the old and still running system.

### 6.1 Configuring GRUB for an Upgrade from SUSE Linux Enterprise 11

The GRUB configuration is stored in `/boot/grub/menu.lst`. Open this file and append a section as shown below. This will start the upgrade:

```
title SUSE Linux Enterprise Server 12 Update
  root (hd0,1)
  kernel /boot/linux.install <options>
  initrd /boot/initrd.install
```

For `<options>`, find below the parameters which need to be included. Make sure that the root value matches the one of your other sections so that it points to the same partition. Optionally, you can configure GRUB to boot a different default section next time. To do so, adjust the number according to your menu, starting from 0:

```
# grubonce 2
Using entry #2: SUSE Linux Enterprise Server 12 Installer
```

### 6.2 Configuring GRUB2 for an Upgrade from SUSE Linux Enterprise 12

GRUB2 generates the boot menu based from kernels and other operating systems found in the system. However, it still allows you to add a custom section.

First, locate the menu entry for your system in `/boot/grub2/grub.cfg`. It should look like following:

```
menuentry 'SLES 12-SP4' --class sles --class gnu-linux --class gnu --class os
  $menuentry_id_option 'gnulinux-simple-cd77493e-f701-4624-8074-21f0061e0727' {
    load_video
    set gfxpayload=keep
```

```

insmod gzio
insmod part_msdos
insmod ext2
set root='hd0,msdos2'
if [ x$feature_platform_search_hint = xy ]; then
    search --no-floppy --fs-uuid --set=root --hint='hd0,msdos2'  cd77493e-
f701-4624-8074-21f0061e0727
else
    search --no-floppy --fs-uuid --set=root cd77493e-f701-4624-8074-21f0061e0727
fi
echo  'Loading Linux 4.12.14-94.41-default ...'
linux  /boot/vmlinuz-4.12.14-94.41-default root=UUID=cd77493e-
f701-4624-8074-21f0061e0727 resume=/dev/vda1 splash=silent quiet showopts
echo  'Loading initial ramdisk ...'
initrd /boot/initrd-4.12.14-94.41-default
}

```

Next, open the file `/etc/grub.d/40_custom` and create a custom entry in it. It will only differ from the one above in the title, path to kernel, and `initrd` and kernel parameters (see the lines `menuentry`, `linux` and `initrd`):

```

menuentry 'SLES 15 Upgrade' {
    load_video
    set gfxpayload=keep
    insmod gzio
    insmod part_msdos
    insmod ext2
    set root='hd0,msdos2'
    if [ x$feature_platform_search_hint = xy ]; then
        search --no-floppy --fs-uuid --set=root --hint='hd0,msdos2'  cd77493e-
f701-4624-8074-21f0061e0727
    else
        search --no-floppy --fs-uuid --set=root cd77493e-f701-4624-8074-21f0061e0727
    fi
    echo  'Loading Linux 4.12.14-94.41-default ...'
    linux  /boot/linux.install <options>
    echo  'Loading initial ramdisk ...'
    initrd /boot/initrd.install
}

```

Keep the lines you do not need to change unchanged. They ensure that the boot loader loads the right modules to load your installation kernel.

For `<options>`, find the parameters which need to be included below.

After the menu entry is created, re-create the GRUB menu and, optionally, set the default boot option for the next reboot:

```
# grub2-mkconfig -o /boot/grub2/grub.cfg
```

```
Generating grub configuration file ...
Found theme: /boot/grub2/themes/SLE/theme.txt
Found linux image: /boot/vmlinuz-4.12.14-94.41-default
Found initrd image: /boot/initrd-4.12.14-94.41-default
done
# grub2-once --list
0 SLES 12-SP4
1 Advanced options for SLES 12-SP4>SLES 12-SP4, with Linux 4.12.14-94.41-default
2 Advanced options for SLES 12-SP4>SLES 12-SP4, with Linux 4.12.14-94.41-default
(recovery mode)
3 SLES 15 Upgrade
4 halt
# grub2-once 3
```

## 6.3 Setting the Boot Loader Options

You can insert into the boot loader any of the options you can use when performing a regular installation or upgrade. Those include options to start a remote installation or upgrade (via SSH or VNC), enforcing a text mode instead of the graphical User Interface (UI), or starting AutoYaST. These options are not covered by this document. For more details, refer to the [documentation \(http://www.suse.com/documentation/\)](http://www.suse.com/documentation/) of the respective product.

There are, however, options which need to be present:

- install=<URL> points the installer to the URL that hosts your installation repository. Set it according to where you prepared the installation media.
- upgrade=1 is necessary to start the upgrade workflow instead of performing a new installation.
- autoyast=<URL> is necessary if you choose to not upgrade manually, but via AutoYaST. Set the location of the AutoYaST profile to drive the upgrade process.
- autoupgrade=1 is necessary to perform a system upgrade with AutoYaST. In this case, skip the upgrade=1 option. Use it together with the autoyast option.
- instsys=<URL> is necessary if you want to perform an upgrade via SMT or RMT.

For more information about AutoYaST and how to use it for a system installation or upgrade, refer to the Deployment Guide of the respective product.

## 7 Preparing the Installation System for an Upgrade via SMT

SMT or RMT provide the repository mirrored from SUSE Customer Center (SCC). However, this repository does not include the installation system, which is necessary to start the upgrade. Since the release of SUSE Linux Enterprise 15, it is possible to get the installation system from a different location than the installation repository.

The installation system is located on the installation media under the path `/boot/<architecture>/root`. It is also located in the directory `/srv/tftpboot/<product>-<version>-<architecture>/boot/<architecture>/root`, which is shipped with the online repositories of the respective product (package `tftpboot-installation-<product>-<version>-<architecture>.noarch.rpm`). To use the installation environment from a different path, copy this patch from the installation media to another location, where the installer can fetch it (the same limitations as for the installation repository apply).

The full kernel parameters for booting usually look as follows:

```
upgrade=1
instsys=tftp://<server-IP>/SLE-15-x86_64/boot/x86_64/root
install=http://<server-IP>/repo/SUSE/Products/SLE-Product-SLES/15/x86_64/product/
```

The paths above are based on the standard path on the SMT server and on the location of the installation system provided by the package from the repository. Adjust them if necessary.

## 8 Performing the Upgrade

After having set the boot loader, reboot your system. Choose the custom boot loader entry to start the upgrade process. The upgrade itself looks the same as if you booted the installation media and selected “Upgrade” from its boot menu.

When the system is upgraded, remove the newly created boot loader section if it is still present. Next, set your default boot loader section as needed.

Finally, remove the kernel and `initrd` you copied to your system and used for the upgrade.

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If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with...Texts". line with this:

with the Invariant Sections being LIST THEIR TITLES, with the  
Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST.

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

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