



# How to Set Up a Multi-PXE Installation Server

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SUSE Linux Enterprise Server

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This SUSE Best Practices document explains how to set up a multi-architecture PXE environment for the installation of the SUSE Linux Enterprise Server operating system on x86\_64 and ARMv8 platforms with both BIOS and EFI.

Components that usually should be hosted on the installation server are also included. This helps improving deployment times in multi-architecture environments.

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# 1 System Requirements

For a reasonable install server, you need:

- 200 GB drive space
- 5 GB RAM
- Two network connections

The relatively huge drive space is needed if your installation server should also serve as your Subscription Management (SMT) server. Your deployment will use the SMT server in an ongoing manner for mirroring updates for the architectures in question in addition to hosting the installation repositories.

# 2 Installing the Operating System

First, install SUSE Linux Enterprise Server 12 SP2 on a virtual or a physical system.

On the registration screen, click the “Network Configuration” button at the upper right and configure the network. You can use two different interfaces: one for the public network with access to the Internet, and one for the cluster network. Deploying using the cluster network has several advantages:

- It is a private network for the storage systems only and thus there will be no conflict with other DHCP servers or PXE servers
- Generally it is faster than the public network

Use the **Installation Settings** screen to review and change several proposed installation settings. Clicking **Software** opens the **Software Selection and System Tasks** screen, where you can change the software selection by selecting or deselecting patterns.

The default scope of software includes the base system and X Window with the GNOME desktop. Deselect “X Window with the GNOME desktop”. For this, you are also safe deselecting 32-bit compatibility libraries.

## 3 Setting Up NTP Server

The NTP server is used to act as an authoritative time source. Start YaST, select **NTP Server** and configure it to start at boot time. Under security settings, select **Open Port in Firewall** and click **OK**. When you use the install server, you can point the systems being deployed back to it for time synchronization.

## 4 Setting Up DHCP Services

Go into YaST and select **DHCP Server** from network services. Configure the IP range you want to use. After that, it is your choice on whether you use YaST or edit the configuration file (`/etc/dhcpd.conf`) manually. As with the other services, be sure to open the ports in the firewall. The end result needs to be a file that looks like the below:

```
option domain-name "my.lab";
option domain-name-servers 172.16.253.5;
option routers 192.168.124.1;
option ntp-servers 192.168.124.3;
option arch code 93 = unsigned integer 16; # RFC4578
default-lease-time 3600;
ddns-update-style none;
subnet 192.168.124.0 netmask 255.255.255.0 {
    range 192.168.124.100 192.168.124.199;
    next-server 192.168.124.3;
    default-lease-time 3600;
    max-lease-time 3600;
    if option arch = 00:07 or option arch = 00:09 {
        filename "/EFI/x86/bootx64.efi";
    } else if option arch = 00:0b {
        filename "/EFI/armv8/bootaa64.efi";
    } else {
        filename "/bios/x86/pxelinux.0";
    }
}
```



### Note: `if option arch`

The `if option arch` sections allow the DHCP server to make the correct decision on which file to use for booting.

## 5 Setting Up Repositories

The next step is to create the installation source directories. Use a structure similar to [/srv/install/arch/product/version](#).

```
/srv/install/x86/sles12/sp2/cd1
/srv/install/armv8/sles12/sp2/cd1
```

Now mount the install media into the appropriate location. Be sure to add it to [/etc/fstab](#) for persistence between reboots.

```
mount -o loop, crossmnt /root/sles12sp2.iso /srv/install/x86/sles12/sp2/cd1/
```

Do the same for each architecture's boot media.

The final part of setting up the repositories is to export them. Although there are other supported methods such as HTTP, FTP, etc., use NFS for this scenario. First, enable the NFS server through YaST and select **Open Port in Firewall**. In this instance, export the entire [/srv/install](#) structure as seen in the sample [/etc/exports](#) entry below.

```
/srv/install *(ro,root_squash,sync,no_subtree_check)
```

## 6 Setting Up TFTP

Now you need to enable the TFTP server. To do so, start YaST and select **TFTP Server** from **Network Services**. The system then prompts to “install tftp”. Select **Enable**, leave the image directory at [/srv/tftpboot](#), select **Open Port in Firewall**, and click **OK**.

## 7 Setting Up PXE Boot

To ensure you set up your install server correctly, read carefully through the following sections. Proceed as described and double check your entries to avoid typos. Getting all the right files in the right places allows you to add more architectures, operating system install options, etc.

Create a structure in [/srv/tftpboot](#) to support the various options:

```
mkdir /srv/tftpboot/bios
mkdir /srv/tftpboot/bios/x86
mkdir /srv/tftpboot/EFI
mkdir /srv/tftpboot/EFI/x86
```

```
mkdir /srv/tftpboot/EFI/x86/boot
mkdir /srv/tftpboot/EFI/armv8
mkdir /srv/tftpboot/EFI/armv8/boot
```

## 7.1 Setting Up the x86 BIOS Boot Environment

At this point, you need to copy the necessary boot files for the x86 BIOS environment to the appropriate boot location. To do so, navigate to the appropriate directory as shown below:

```
cd /srv/install/x86/sles12/sp2/cd1/boot/x86_64/loader/
cp -a linux initrd message /srv/tftpboot/bios/x86/
```

While still in the loader directory, create the directory for the configuration file and copy it in:

```
mkdir /srv/tftpboot/bios/x86/pxelinux.cfg
cp -a isolinux.cfg /srv/tftpboot/bios/x86/pxelinux.cfg/default
```

Copy pxelinux.0 to the same structure:

```
cp /usr/share/syslinux/pxelinux.0 /srv/tftpboot/bios/x86/
```

Now that the files are all in place, edit the configuration to ensure all the correct boot options are also in place. Start with editing /srv/tftpboot/bios/x86/pxelinux.cfg/default. See the example below:

```
default hddisk

# hard disk
label hddisk
    localboot -2
# install
label install
    kernel linux
    append initrd=initrd showopts install=nfs://192.168.124.3/srv/install/x86/sles12/sp2/cd1

display message
implicit 0
prompt 1
timeout 600
```

Now edit /srv/tftpboot/bios/x86/message to reflect the default file you edited before. See the example below:

```
Welcome to the Installer Environment!
```

To start the installation enter 'install' and press <return>.

Available boot options:

```
harddisk - Boot from Hard Disk (this is default)
install  - Installation
```

Have a lot of fun...

## 7.2 Setting Up the x86 EFI Boot Environment

Start by copying the files required for UEFI booting of a **grub2-efi** environment.

```
cd /srv/install/x86/sles12/sp2/cd1/EFI/B00T
cp -a bootx64.efi grub.efi MokManager.efi /srv/tftpboot/EFI/x86/
```

Copy the kernel and initrd to the directory structure.

```
cd /srv/install/x86/sles12/sp2/cd1/boot/x86_64/loader/
cp -a linux initrd /srv/tftpboot/EFI/x86/boot
```

Now you need to create a `grub.cfg` file. This file goes in `/srv/tftpboot/EFI/x86` and should have contents similar to the below example:

```
set timeout=5
menuentry 'Install SLES12 SP2 for x86_64' {
  linuxefi /EFI/x86/boot/linux install=nfs://192.168.124.3/srv/install/x86/sles12/sp2/cd1
  initrdefi /EFI/x86/boot/initrd
}
```

## 7.3 Setting Up the ARMv8 EFI Boot Environment

Setting up the ARMv8 EFI boot environment is done in a way very similar to the x86\_64 EFI environment. Start by copying the files required for UEFI booting of a **grub2-efi** environment:

```
cd /srv/install/armv8/sles12/sp2/cd1/EFI/B00T
cp -a bootaa64.efi /srv/tftpboot/EFI/armv8/
```

Copy the kernel and initrd to the directory structure:

```
cd /srv/install/armv8/sles12/sp2/cd1/boot/aarch64
cp -a linux initrd /srv/tftpboot/EFI/armv8/boot
```

Next you need to edit the `grub.cfg` file and add a new section. This file is located in the directory `/srv/tftpboot/EFI/armv8`. You should add contents similar to the example below.

```
menuentry 'Install SLES12 SP2 for SoftIron OverDrive' {
  linux /EFI/armv8/boot/linux network=1 usesh=1 sshpassword="suse" \
  install=nfs://192.168.124.3/srv/install/armv8/sles12/sp2/cd1 \
  console=ttyAMA0,115200n8
  initrd /EFI/armv8/boot/initrd
}
```

This addition to the configuration file contains a few other options to enable the serial console and to allow installation via `ssh`. This is helpful for systems that do not have a standard KVM console interface.



### Note: ARM Platforms

Be aware that this configuration is specifically set up only for a specific ARM platform.

## 8 Setting Up SMT

The SMT service provides a local repository mirror for updates to your software. Follow the instructions in the Subscription Management Tool Guide at <https://documentation.suse.com/sles/12-SP4/html/SLES-all/smt-installation.html> to install and configure SMT. Be sure to select both the pool and update repositories for each product you are supporting with this server.

## 9 Installation Server Completed


At this point, you are ready to use the installation server for BIOS and EFI on x86 and EFI on ARMv8. Be sure to select the SMT server as the registration server during installation. You can gain further value by building custom AutoYaST files as well. These files can enable a streamlined installation process and even an unattended process if everything is well defined.

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