

# Slackware Live Edition

## Preface

Welcome to the Slackware Live Edition! This is a version of Slackware 14.2 (and newer), that can be run from a DVD or a USB stick. It is an ISO image meant to be a showcase of what Slackware is about. You get the default install, no custom packages or kernel, but with all the power of Slackware. The ISO is created from scratch using a Slackware package mirror, by the “liveslak” scripts.

Slackware Live Edition does not have to be installed to a computer hard drive (*however you do have that choice if you want to: using the `setup2hd` script*). You can carry the USB stick version with you in your pocket. You'll have a pre-configured Slackware OS up & running in a minute wherever you can get your hands on a computer with a USB port.

The USB version is “persistent” - meaning that the OS stores your updates on the USB stick. The CD/DVD versions (and the USB stick if you configure it accordingly) operate without persistence, which means that all the changes you make to the OS are lost when you reboot.

In order to protect your sensitive private data in case you lose your USB stick (or in case it gets stolen) you can enhance your persistent USB Live OS with an encrypted homedirectory and/or an encrypted persistence file, to be unlocked on boot with a passphrase that only you know.

## Why yet another Slackware Live

The reasons I had for creating the Slackware Live Edition are as follows:

1. Provide a Live version of Slackware proper; i.e. show Slackware as it is, but without having to install it. No hiding of kernel messages scrolling across the screen at boot; no custom wallpapers, etcetera. Meant for educational, evaluation and demonstration purposes.
2. The target should be slackware-current, the bleeding edge. Many people want to know what Slackware's development edition looks like but are hesitant to install slackware-current for fear that it breaks stuff and causes productivity loss.
3. Provide a way to generate a Live ISO with just a mirror of Slackware's packages as the source, fully scripted and deterministic.
4. Still be able to customize its content. For instance provide stripped-down or minimalist versions of Slackware but also allow for the inclusion of 3rd party packages.
5. Option to create a bootable USB stick running Slackware Live (which is different from 'dd'-ing the hybrid ISO to a USB stick!)
6. KISS: Keep It Simple Stupid!

## ISO variants

The “liveslak” scripts can generate a variety of Slackware flavors:

1. a complete 64bit Slackware-current Live Edition (in a 2.6 GB ISO);
2. a slimmed-down XFCE ISO (700 MB) with XDM as the graphical login manager. It fits on a

CDROM medium or a 1 GB USB stick;

3. a ISO image (3.1 GB) of Slackware64-current containing Plasma 5 instead of KDE 4, with an addition of several other packages from the alienBOB repositories: vlc, libreoffice, calibre, qbittorrent, ffmpeg, chromium, openjdk, veracrypt.
4. a Mate variant (1.7 GB) where KDE 4 has been replaced by Mate (a Gnome 2 fork);
5. a Cinnamon flavour (a fork of the Gnome 3 Shell replacing Slackware's KDE 4).
6. a *Custom* variant which you can give your own name, its own package list and custom post-install configuration.

## Downloading ISO images

Common download locations are:

- Primary site: <http://bear.alienbase.nl/mirrors/slackware-live/> (rsync://bear.alienbase.nl/mirrors/slackware-live/)
- Darren's <http://slackware.uk/people/alien-slacklive/> (rsync://slackware.uk/people/alien-slacklive/)
- Willy's <http://repo.ukdw.ac.id/slackware-live/>
- Ryan's <https://seattleslack.ryanpcmcquen.org/mirrors/slackware-live/>
- Shasta's <http://ftp.slackware.pl/pub/slackware-live/> (rsync://ftp.slackware.pl/slackware-live/)

## Enduser Documentation

### Using the ISO image

The ISO images are hybrid, which means you can either burn them to DVD, or use 'dd' or 'cp' to copy the ISO to a USB stick. Both methods will give you a live environment which will allow you to make changes and seemingly “write them to disk”. The changes will actually be kept in a RAM disk, so a reboot will “reset” the live OS to its original default state. In other words, there is no persistence of data.

Slackware Live Edition knows two user accounts: “root” and “live”. They have passwords, and by default these are... you guessed: “root” and “live”. Also by default, the ISOs will boot into runlevel 4, i.e. you will get a graphical login. The bootloader allows you to pick a non-US language and/or keyboard layout and (on boot of an UEFI system) a custom timezone.

Slackware Live Edition deviates as little as possible from a regular Slackware boot. Once you have passed the initial Liveboot stage and brought up the actual OS, you login as user “live”. From that moment onwards, you are in a regular Slackware environment.

### Booting the Live OS

#### BIOS boot

Slackware Live Edition uses syslinux to boot the Linux kernel on BIOS computers. To be precise, the “isolinux” variant is installed to the ISO image and the “extlinux” variant is installed into the Linux

partition of the USB Live version.

Syslinux shows a graphical boot menu with a nice Slackware-themed background and several options:

- Start (SLACKWARE | PLASMA5 | XFCE | MATE) Live (depending on which of the ISOs you boot)
- Non-US Keyboard selection
- Non-US Language selection
- Memory test with memtest86+

You can select a keyboard mapping that matches your computer's. Also you can boot Slackware in another language than US English. If you stick to US English interface language you will probably still want to change the timezone because it will default to UTC. You have to specify a custom timezone manually by adding "tz=YourGeography/YourLocation" because the syslinux bootmenu does not offer you a selection of timezones. Syslinux allows you to edit the boot commandline by pressing <TAB>. Press <ENTER> to boot after you made your changes or <ESC> to discard your edit and return to the menu.

## UEFI boot

On UEFI computers, Grub2 handles the boot and it will show a menu similar (and similarly themed) to the Syslinux menu:

- Start (SLACKWARE | PLASMA5 | XFCE | MATE) Live (depending on which of the ISOs you boot)
- Non-US Keyboard selection
- Non-US Language selection
- Non-US Timezone selection
- Memory test with memtest86+
- Help on boot parameters

Editing a Grub menu before booting it is possible by pressing the "e" key. After making your changes to the boot commandline, press <F10> to boot. To discard your changes, press <ESC>.

Another difference between Syslinux and Grub2 menus: in Grub2 you can select a non-US keyboard, language and/or timezone and you will return to the main menu every time. You still have to select "Start SLACKWARE Live" to boot the computer. In the Syslinux menu, only the keyboard selection menu will return you to the main menu. Any non-US \*language\* selection on the other hand will boot you into Slackware Live immediately; without returning to the main menu. This is a limitation of syslinux which would require exponentially more menu files to construct a menu with more choices. Grub2 supports variables which make it easy to modify a menu entry's characteristics.

## Transferring ISO content to USB stick

A script is available which allows you to transfer the ISO image content to a USB stick, making some modifications depending on the script's parameters.

The USB stick will be erased and re-formatted when running this script! Before inflicting any irreversible damage, the script will show you a prompt at which point you can evaluate whether it is safe to continue.

This script, called 'iso2usb.sh', accepts the following parameters:

```

-c|--crypt size|perc      Add a LUKS encrypted /home ; parameter is the
                           requested size of the container in kB, MB, GB,
                           or as a percentage of free space.
                           Examples: '-c 125M', '-c 1.3G', '-c 20%'.
-f|--force                Ignore most warnings (except the back-out).
-h|--help                 This help.
-i|--infile <filename>   Full path to the ISO image file.
-o|--outdev <filename>   The device name of your USB drive.
-p|--persistence <name> Custom name of the 'persistence'
                           directory/file.
-r|--refresh              Refresh the USB stick with the ISO content.
                           No formatting, do not touch user content.
-u|--unattended           Do not ask any questions.
-v|--verbose              Show verbose messages.
-w|--wait<number>       Add <number> seconds wait time to initialize
                           USB.
-C|--cryptpersistfile size|perc
                           Use a LUKS-encrypted 'persistence' file instead
                           of a directory (for use on FAT filesystem).
-P|--persistfile          Use an unencrypted 'persistence' file instead
                           of a directory (for use on FAT filesystem).

```

#### Examples:

- Create a USB version of Slackware Live, where the USB stick is known to the system as '/dev/sdX'. Note - the value for the output parameter is the device name of the stick and not one of its partitions!

```
# ./iso2usb.sh -i ~/download/slackware64-live-14.2.iso -o /dev/sdX
```

- Create a USB Live like above, but this time adding an encrypted /home filesystem with 750 MB of space, and at the same time increase the wait time on boot to 15 seconds (useful for slow USB media that fail to start the Live OS otherwise):

```
# ./iso2usb.sh -i slackware64-live-current.iso -o /dev/sdX -c 750M -w 15
```

- Create a USB Live with an encrypted /home (allocating 30% of the stick's free space for /home) and where the persistent data will be stored in a container file instead of a directory:

```
# ./iso2usb.sh -i slackware64-live-current.iso -o /dev/sdX -c 30% -P
```

- Create a USB Live with both the /home and the persistent data encrypted (the persistence filesystem will be 300 MB in size):

```
# ./iso2usb.sh -i slackware64-live-current.iso -o /dev/sdX -c 30% -C 300M
```

You might have noticed that the “-P” parameter does not accept a size parameter. This is because the unencrypted container file is created as a 'sparse' file that starts at zero size and is allowed to grow dynamically to a maximum of 90% of the initial free space on the Linux partition of the USB stick.

## PXE booting the Live OS

Slackware Live Edition can do a network boot using PXE protocol off a NFS export. Extract the content of the ISO to (for instance) a new directory called `slackware-live` below your TFTP server's `/tftpboot` directory and export that directory via NFS. Then add lines like this to your `pxelinux.cfg/default` file (assuming your NFS server has IP address `192.168.0.1`):

```
label liveslak
kernel slackware-live/boot/generic
append initrd=slackware-live/boot/initrd.img load_ramdisk=1 prompt_ramdisk=0
rw printk.time=0 kbd=us tz=Europe/Amsterdam locale=us_EN.utf8
nfsroot=192.168.0.1:/tftpboot/slackware-live hostname=pxelive
```

As shown in the example above, a boot parameter `nfsroot` is used for network boot. The parameter value defines the IP address of your NFS server and the path of the NFS export where you extracted the Slackware Live ISO. Hint: to get a listing of the exported shares of your NFS server, run `showmount -e localhost` on the NFS server.

Actually, two boot parameters are available to properly support network boot. A second boot parameter `nic` can be used to define the characteristics of your Live environment's network configuration, like the name of the network interface, static IP address and such. If you are on a network where a DHCP server configures your clients, then the `nic` parameter will not be needed as Slackware Live Edition will figure out all the details by itself.

Syntax of these two parameters:

```
nfsroot=ip.ad.dr.ess:/path/to/liveslak
nic=<driver>:<interface>:<dhcp|static>[:ipaddr:netmask[:gateway]]
```

Example uses of the two network boot parameters:

```
nfsroot=192.168.1.1:/tftpboot/slackware-live
nic=auto:eth0:dhcp
nic=auto:eth0:static:10.0.0.21:24:
nic=:eth1:static:192.168.1.6:255.255.255.248:192.168.1.1
```

After you have setup your PXE environment (DHCP, TFTP and NFS servers) properly using the above information, boot one of your PXE-capable computers, interrupt the boot and select "network boot" and type or select the appropriate label (in the above example, that would be `liveslak`). You will see the kernel and `initrd` being downloaded and booted, and then the Live OS will start just as if it was running from a local medium.

If your DHCP server takes too long in acknowledging the client's request, the DHCP client times out and the boot of your Live OS will fail because the NFS-mounted Live filesystem will not become available. In that case you can try increasing the wait time before the DHCP client decides that it is not going to get an IP address from the server. Add the boot parameter `dhcpwait=30` (example value) where the number `30` is the number of seconds the DHCP client should wait for a server response. You should of course pick a value that is sufficiently large for your network setup. The default DHCP wait time of the Live OS is 20 seconds.

Persistence is not supported in this configuration; currently the overlayfs does not support NFS as a writable layer in the live filesystem.

## PXE server

Slackware Live Edition is not just capable of booting as a PXE client; it is able to run a PXE server all by itself.

What does that mean?

A practical example would be that you bring a USB stick with Slackware Live Edition to a LAN party, use it to boot one of the computers and then all the other computers in the (wired) LAN will be able to do a network boot and run the same Slackware Live Edition a couple of minutes later. The computer with the USB stick will act as the PXE server and all the other computers will be its PXE clients, reading the Slackware data off that USB stick. The clients will inherit the server's timezone, language and keyboard settings by default but those can be overridden. The PXE clients will not have 'persistence'. If the server has access to the Internet, the clients will have access as well.

How to start the PXE server?

When you boot the Live OS you can then start a script "pxeserver" from the console in runlevel 3 or from an X terminal in runlevel 4. The script will gather all required information and if it is unable to figure something out by itself it will ask you. If it is unable to figure out the wired network interface that it should use, you can add the name of your interface (for instance, eth1) as a single parameter to the script when you start it.

The PXE server uses dnsmasq to offer DNS to the PXE clients. The dnsmasq program will enable its internal DHCP server capabilities if your LAN does not have its own DHCP server. Dnsmasq will also start a TFTP server which the PXE clients will connect to in order to retrieve the boot files (kernel and initrd). The pxeserver script also starts a NFS server which will be used by the Live initrd to obtain the squashfs modules and boot the Live OS. If your PXE server has multiple network interfaces, for instance a wireless interface which is connected to the outside world and a wired interface connected to another computer which will become a PXE client (or indeed connected to a switch with a whole bunch of prospective PXE clients behind that) then the PXE server will setup packet forwarding so that the PXE clients will be able to access the outside world through the wired interface and out to that other interface.

If you have multiple network interfaces, it is important to know that dnsmasq will only bind to the interface where you want PXE clients to connect to. In a multi-NIC situation where a second NIC is connected to the outside world (your local network), this means that the DHCP/DNS server started by dnsmasq will not interfere with an existing DHCP server in your local network.

Once the PXE server is running, the script will show you the dnsmasq's activity log in a dialog window so that you can monitor the PXE clients that are connecting.

If your PXE server computer has sufficient RAM, it is strongly advised to boot the server's Live OS from the USB stick with the 'toram' parameter. When more than a few PXE clients start reading OS files from the PXE server, the USB stick will become a bottleneck. Running the server OS from RAM will get rid of that bottleneck.

## Boot parameters explained

Press <F2> in the syslinux boot screen for an overview of (most) boot parameters. When booting Grub, select the menu "Help on boot parameters" instead. The Grub help is ugly, I know, but Grub does not offer anything better than this.

The following parameters are recognized by Slackware Live Edition. To boot with default values just press ENTER.

### Desktop Environment

0|1|2|3|4|5|6|S|s|single ⇒

Select a runlevel to start with.  
The default is 4 for graphical login.

kbd=fr xkb=ch,fr ⇒

Example of custom X keyboard layout.  
The parameter xkb can be set to "XkbLayout,XkbVariant,XkbOptions".  
The boot menus will configure some of these for you but you can of course always modify the values.  
Note that the optional XkbOptions can be several comma-separated values.  
The XkbLayout and XkbVariant values must not contain commas.  
You can set just the XkbVariant by adding something like "kbd=ch xkb=,fr"

livepw="somestring" ⇒

Change the password for user "live".  
The password is passed as a cleartext string.

locale=nl\_NL kbd=nl tz=Europe/Amsterdam ⇒

Example of language,  
keyboard and/or timezone customization.

rootpw="somestring" ⇒

Change the password for user "root".  
The password is passed as a cleartext string.

### Custom software

load=nvidia ⇒

Load and configure Nvidia drivers if available

in the ISO (not for SLACKWARE and XFCE variants by default).

load=mod1[,mod2[...]] ⇒

Load one or more squashfs modules from the directory "/liveslak/optional". By default none of these "optional" modules are loaded on boot.

noload=mod1[,mod2[...]] ⇒

Prevent loading of one or more squashfs modules from the directory "/liveslak/addons". By default all these "addon" modules are loaded on boot.

## Network boot

dhcpwait=<numseconds> ⇒

Maximum wait time for the DHCP client to configure a network interface (default: 20 seconds).

nfsroot=ip.ad.dr.ess:/path/to/liveslak ⇒

defines the IP address of the NFS server, and the path to the extracted content of Slackware Live Edition.

nic=<driver>:<interface>:<dhcp|static>[:ipaddr:netmask[:gateway]] ⇒

network device customization, usually this parameter is not needed when your network runs a DHCP server. Specify a driver if UDEV does not detect the device. Specify the interface if Slackware Live can not figure it out. If you specify 'static' you need to also specify ipaddr and netmask. The gateway is optional but needed to access the internet for instance.

## Hardware related

localhd ⇒

initialize RAID/LVM on local hard drives.

tweaks=tweak1[,tweak2[,...]] ⇒

Implemented tweaks:  
nga - no glamor 2D acceleration, avoids error "EGL\_MESA\_drm\_image required".  
nsh - no 'new style' sub-pixel hinting in freetype.



```
tpb - enable TrackPoint scrolling while holding down middle mouse button.  
syn - start the syndaemon for better support of Synaptics touchpads.  
ssh - start the SSH server (disabled by default).
```

nomodeset ⇒

```
Boot without kernel mode setting, needed with  
some machines.
```

rootdelay=10 ⇒

```
Add 10 second delay to give the kernel more  
time to initialize USB. Try this if booting fails. Default is 5.
```

swap ⇒

```
Allow the Live OS to activate all swap partitions on  
the local hardware. By default, no swap is touched.
```

## Media tweaks

hostname=your\_custom\_hostname[,qualifier] ⇒

```
Specify a custom hostname. A qualifier 'fixed' can be appended  
to prohibit hostname modification in case of network boot.
```

livemedia=/dev/sdX ⇒

```
Tell the init script which partition  
contains the Slackware Live OS you want to boot. This can  
become necessary if you have another copy of Slackware Live  
installed in another partition. Also accepted: UUID or LABEL.
```

livemedia=/dev/sdX:/path/to/live.iso ⇒

```
Use this if you want to  
load the live OS from an ISO file on a local harddisk partition.
```

livemain=directoryname ⇒

```
Use this if you copied the content  
of the ISO to a different directory than "liveslak".
```

luksvol=file1[:/mountpoint1][,file1[:/mountpoint2],...] ⇒

```
Mount LUKS container "file1" at mount point "/mountpoint1"  
in the Live fs. Multiple files must be separated by a comma.  
Specify "luksvol=" to *prevent* mounting any LUKS container,
```

including an encrypted /home .

nop ⇒

No persistence, i.e. boot the virgin installation in case your "persistence" directory got corrupted. If you want to ignore any persistent data during boot, including LUKS data, specify "nop luksvol=" .

nop=wipe ⇒

Wipe all data from persistence directory or container. Useful in cases where your persistent data got corrupted.

persistence=name ⇒

Use this if you are using a different directory/file than "persistence" for storing persistent data.

toram ⇒

copy the OS from the media to to RAM before running it. You can remove the boot media after booting.

## Troubleshooting

blacklist=mod1[,mod2[...]] ⇒

Add one or more kernel modules to the kernel blacklist to prevent them from loading, in case they cause issues during operation.

debug ⇒

During init, pause at strategic locations while assembling the overlay filesystem and show mount information.

debug=<number> ⇒

'2' enables verbose script execution;  
'4' dumps you into a debug shell right before the switch\_root.

rescue ⇒

After initialization, you will be dropped in a rescue shell to perform lowlevel maintenance.

## Layout of the ISO

The Live ISO contains three directories in the root of its filesystem:

- EFI/
- boot/
- liveslak/

The USB variant with persistence may have an additional directory in the root:

- persistence/
- The EFI/ directory contains the Grub configuration used when you boot the Live OS on a computer with UEFI.
- The boot/ directory contains the syslinux configuration used when the Live OS boots on a computer with a BIOS. This directory also contains the kernel and initrd files which are used to actually boot the OS.
- The liveslak/ directory contains all the squashfs modules which are used to assemble the filesystem of the Live OS, as well as files that are copied directly into the root of the Live filesystem. It contains four subdirectories:
  - addons/ - modules which are stored in this directory will always be added to the Live filesystem unless you prevent that with a "noload=" boot parameter;
  - optional/ - modules in this directory will not be added to the filesystem of the Live OS unless you force this with a "load=" boot parameter;
  - system/ - this directory contains all the modules which were created by the "make\_slackware\_live.sh" script. All these modules are numbered and the Live init script will use that to re-assemble the Live filesystem in the exact same order as they were created initially.
  - rootcopy/ - this directory is empty by default. Anything you (the user of the ISO) add to this directory will be copied verbatim into the filesystem by the init script when the Live OS boots. You can use this feature for instance if you do not want to create a separate squashfs module file for your application configuration files.

## Developer Documentation

### Scripts and tools

#### **make\_slackware\_live.sh**

The first script:

The script "make\_slackware\_live.sh" creates an ISO file as its output which contains the Live OS. Thanks to Linux kernel 4.x and the squashfs-tools package in Slackware, the process of creating a Slackware Live ISO requires **no** (re)compilation of Slackware content or installing 3rd party packages.

The script's inner workings can be subdivided into several distinct stages. For the full Slackware ISO the process stages are as follows:

## Install the Slackware packages

### Stage one:

- The script reads a package sequence for the Live variant and installs all packages in this sequence to subdirectories of a temporary directory tree.
- Every Slackware package set (a, ap, d, ... , y) or package list (min, xbase, xapbase, ...) is installed into a separate 'root' directory.
- Each of those root directories is “squashed” (using squashfs) into a separate squashfs module. Such a module is a single archive file containing the compressed directory structure of the installed packages.
- These module files are subsequently loop-mounted and then combined together into a single read-only directory structure using an “overlay mount”. The overlayfs is relatively new; earlier Live distros have been using aufs and unionfs to achieve similar functionality, but those were not part of any stock kernel source and therefore custom kernels had to be compiled for such a Live distro.
- This “overlay assembly” is the filesystem that will be booted as the filesystem of the Live OS.
- On 'top' of this series of overlaid read-only filesystems, a writable filesystem is added by the “make\_slackware\_live.sh” script. This writable filesystem is used to store all the customizations to our distro that we want to be applied when Slackware Live boots up. See the next section for more detail.
- Note that when you boot the Live OS later on, another writable overlay will be used to capture any write operations performed by the OS. You will perceive the Live OS as a real OS that can write and remove files. That writable filesystem will be:
  - a RAM-based filesystem when the Live OS runs without persistence.
  - a directory or a loop-mounted container file on your USB stick, if you use a USB stick with persistence.

## Configure the Live filesystem with useful out-of-the-box defaults

### Stage two:

- Some filesystem initialization is done when the overlay has been assembled:
  - 'root' and 'live' user accounts are created,
  - an initial environment for the accounts is configured,
  - the desktop environment is pre-configured for first use,
  - the liveslak scripts “makemod” and “iso2usb.sh” are copied to “/usr/local/sbin/” in the ISO for your convenience,
  - if the Live system contains a huge kernel (all ISO variants except XFCE) then the “setup2hd” script and the Slackware installer files are copied to “/usr/local/sbin” and “/usr/share/liveslak” respectively,
  - slackpkg is configured,
  - a locate database is created,
  - etc...
- All these modifications are written to the writable filesystem that was created in the previous section. This filesystem will also be stored on the ISO as a squashfs module and when the Live OS boots, it will be mounted read-only just like all the other modules. Its name will be “0099-slackware\_zzzconf-current-x86\_64.sxz” or more generically “0099-slackware\_zzzconf- $\$SLACKVERSION$ }- $\$ARCH$ .sxz”

## Configure the boot stage of the Live OS

Stage three:

- an initrd is generated, containing a modified “init” script (other Live distros call it a “linuxrc script”) which re-assembles the overlay filesystem on boot and configures the Live OS according to the boot parameters (language, keyboard, timezone, runlevel, ...)
- a slackware generic kernel plus the above initrd are added to a syslinux (for BIOS computers) and a grub2 (for UEFI computers) configuration.

## Create the ISO image

Stage four:

- a bootable ISO file is created using mkisofs.
- the “isohybrid” command is run on the ISO so that you can “dd” or “cp” the ISO to a USB stick and thus create a bootable USB media.

Done! You can find the ISO file and its MD5 checksum in the /tmp directory.

## iso2usb.sh

The second script:

The “iso2usb.sh” script's runtime usage is explained in detail in a previous paragraph “Transferring ISO content to USB stick”.

This section explains how the script modifies the ISO for the enhanced USB functionality.

## Mounting a filesystem in an encrypted container

The script will create a file of requested size in the root of the Live partition using the 'dd' command. The 'cryptsetup luksCreate' command will initialize the encryption, which causes the script to prompt you with “are you sure, type uppercase YES” after which an encryption passphrase must be entered three times (two for intializing, and one for opening the container). If the container is used for an encrypted /home, its filename will be “slhome.img”. The script will copy the existing content of the ISO's /home into the container's filesystem which will later be mounted on top of the ISO's /home (thereby masking the existing /home). The Live OS is instructed to decrypt the container and mount the filesystem. This is done by editing the file “/luksdev” in the initrd and adding a line: “/slhome.img”. The iso2usb.sh script only supports creating and configuring an encrypted /home, but you can create additional encrypted containers yourself and mount them on other locations in the ISO's filesystem. In order for this to work, you need to edit the “/luksdev” file and add a line “/your/container.img:/your/mountpoint” i.e. container path and the target mount directory on a single line, separated by a colon. The Live init script will create the mount point if it is missing.

## Using a container file for storing persistence data

A second type of encrypted container exists, which can be used for storing your persistence data. The Live init script will check if it needs to enable persistence in this order:

1. is the USB filesystem writable? If so,
  1. does a directory `/persistence` exist? If so, use that; if not,
  2. does a file `/persistence.img` exist? If so, mount the file and if it is an encrypted container, ask for a passphrase during boot.

## Adding USB wait time

For slow USB media, the default 5 seconds wait time during boot are sometimes insufficient to allow the kernel to detect the partitions on your USB device. The script can optionally add more wait time. It does this by editing the file `"wait-for-root"` in the `initrd` and updating the value which is stored there (by default `"5"` is written there by the `"make_slackware_live.sh"` script).

## makemod

The third script:

The `"makemod"` script allows you to create a Slackware Live module easily, with a Slackware package or a directory tree as its input parameter.

Usage:

```
# makemod <packagename|directory> modulename.sxz
```

- The first parameter is either the full path to a Slackware package, or else a directory.
  - If a packagename is supplied as first parameter, it will be installed into a temporary directory using Slackware's `"installpkg"`. The content of the temporary directory will be squashed into a module by the `"squashfs"` program.
  - If a directoryname is supplied, its content will be squashed into a module by the `"squashfs"` program..
- The second parameter is the full pathname of the output module which will be created.

You can copy the module you just created (minding the filename conventions for a Slackware Live module, see paragraph `"Slackware Live module format"`) to either the `optional/` or to the `addon/` directory of your Live OS. If you copy it to the `optional/` or `addon/` directory of the `liveslak` sources then `"make_slackware_live.sh"` will use the module when creating the ISO image.

## setup2hd

The fourth script:

The `"setup2hd"` script enables you to install the running Live OS to the computer's local hard disk. The `"setup2hd"` is a modified Slackware installer, so you will be comfortable with the process. There is

no 'SOURCE' selection because the script knows where to find the squashfs modules. After you select the target partition(s), every active module of the Live OS variant (SLACKWARE, PLASMA5, MATE, ...) is extracted to the hard drive. After extraction has completed, the script summarizes how many modules have been extracted. It will also show an example command to extract any remaining inactive or disabled modules manually. The final step in the installation is again the stock Slackware installer which kicks off the Slackware configuration scripts.

## pxeserver

The fifth script:

The pxeserver script works as follows:

- It requires a wired network; wireless PXE boot is impossible.
- The pxeserver script tries to find a wired interface; you can pass an explicit interfacename as parameter to the script (optional).
- If multiple wired interfaces are detected, a dialog asks the user to select the right one.
- A check is done for DHCP configuration of this wired interface;
  - If DHCP configuration is found then pxeserver will not start its own DHCP server and instead will rely on your LAN's DHCP server.
  - If no DHCP config is found, the script will ask permission to start its own internal DHCP server. Additionally the user will be prompted to configure an IP address for the network interface and IP range properties for the internal DHCP server.
- The script will then start the PXE server, comprising of:
  - dnsmasq providing DNS, DHCP and BOOTP;
  - NFS and RPC daemons;
- The script will detect if you have an outside network connection on another interface and will enable IP forwarding if needed, so that the PXE clients will also have network access.
- The Live OS booted via pxelinux is configured with additional boot parameters:

```
nfsroot=<server_ip_address>:/mnt/livemedia
luksvol=
nop
hostname=<distroname>
tz=<server_timezone>
locale=<server_locale>
kbd=<server_kbd_layout>
```

Which shows that the configuration of the Live OS where the PXE server runs is largely determining the configuration of the PXE clients.

- Note that when networkbooting, the hostname of the Live OS will be suffixed with the machine's MAC address to make the hostname of every network-booted computer unique.

## Creating a Live ISO from scratch

Creating an ISO image of Slackware Live Edition requires that you are running Slackware 14.2 or newer (64-bit). Older releases of Slackware have a kernel that is too old to support liveslak's use of the "overlays" kernel functionality, and are lacking the squashfs tools. Likewise, a Slackware Live

Edition can only be created for Slackware 14.2 or newer.

You also need the “liveslak” script collection which can be downloaded from any of the [links at the bottom of this page](#).

Liveslak is a directory tree containing scripts, bitmaps and configuration files. Only 5 scripts are meant to be run by you, the user. These scripts (“make\_slackware\_live.sh”, “iso2usb.sh”, “makemod”, “setup2hd” and “pxeserver”) are explained in more detail in the section “[Scripts and tools](#)” higher up. When creating a Live ISO from scratch, you only need to run the “make\_slackware\_live.sh” script.

## Liveslak sources layout

The toplevel 'liveslak' directory contains the following subdirectories:

- EFI/ - contains the skeleton for boot support on UEFI computers. Some of the UEFI configuration files are dynamically generated by the “make\_slackware\_live.sh” script.
- README.txt - this documentation.
- addons/ - squashfs modules placed in this directory will be loaded into the Live filesystem when the OS boots.
- graphics/ - squashfs modules for proprietary GPU support (Nvidia) can be placed here. The module(s) will be copied to addons/ by the “make\_slackware\_live.sh” script for any Live Desktop Environment (except pure Slackware) that might profit from proprietary driver support.
- local64/ , local/ - these directories can contain Slackware packages considered 'local' i.e. not belonging to any repository. The package(s) will be converted to squashfs module(s) by the “make\_slackware\_live.sh” script, copied to the “addons/” subdirectory in the ISO and loaded into the Live filesystem when the OS boots.
- optional/ - squashfs modules placed in this directory will not automatically be loaded into the Live filesystem when the OS boots. You need to pass “load=[mod]” boot parameter to load any of these.
- pkglists/ - definition files of 3rd party repositories (\*.conf) and the package lists to be used from those repositories (\*.lst) must be placed in this directory.
- skel/ - contains compressed tarballs (whose filenames must match wildcard “skel\*.txz”). These files will be extracted to the “/etc/skel” directory in the Live filesystem.
- syslinux/ - contains the skeleton for boot support on BIOS computers. Some of its files are dynamically generated by the “make\_slackware\_live.sh” script.
- xdm/ - graphical Slackware theme for the XDM graphical session manager for those ISO variants which do not ship with GDM, KDM or SDDM.

The toplevel 'liveslak' directory contains the following files:

- blueSW-128px.png , blueSW-64px.png - these are bitmaps of the Slackware “Blue S” logo, used for the “live” user icon and in the XDM theme.
- grub.tpl - the template file which is used to generate the grub menu for UEFI boot.
- iso2usb.sh - this script creates a bootable USB version with persistence from a Slackware Live ISO.
- languages - this file contains the input configuration for language support. One language per line contains the following fields: “code:name:kbd:tz:locale:xkb”. Example:  
“nl:nederlands:nl:Europe/Amsterdam:nl\_NL.utf8:”
  - code = 2-letter language code



- name = descriptive name of the language
- kbd = name of the console keyboard mapping for this language
- tz = timezone for the language's native country
- locale = the locale used in the country
- xkb = optional custom X keyboard variant for the language
- liveinit - this is the “init” script which is copied into the initrd image for the Live OS. Together with the Slackware generic kernel, the initrd is what boots the computer. The “init” script assembles the Live filesystem from its squashfs modules.
- make\_slackware\_live.conf - the configuration file for the “make\_slackware\_live.sh” script. You can define defaults for many script parameters here so that you do not have to edit the script itself.
- make\_slackware\_live.sh - the script that generates the Live ISO.
- makemod - this script creates a squashfs module out of a Slackware package (or out of a directory tree).
- menu.tpl - template which is used to generate the syslinux boot menu for BIOS computers.
- pxeserver - the script that starts a PXE server allowing other computers to boot Slackware Live over the network.
- setup2hd - the script you use to install your Slackware Live to a harddisk.
- setup2hd.local - here a developer of a custom Live OS can override the default post-installation routine by (re-)defining the function “live\_post\_install()” in the setup2hd script.

## Generate the ISO

The liveslak's “make\_slackware\_live.sh” script accepts optional parameters to tweak the process of Live OS generation:

The script's parameters are:

```
-h                This help.
-a arch          Machine architecture (default: x86_64).
                 Use i586 for a 32bit ISO, x86_64 for 64bit.
-d desktoptype  SLACKWARE (full Slack), KDE4 (basic KDE4),
                 XFCE (basic XFCE), PLASMA5 (full Plasma5 replaces KDE4),
                 MATE (Gnome2 fork replaces KDE4), CINNAMON (fork of
Gnome3
                 Shell replaces KDE4).
-e              Use ISO boot-load-size of 32 for computers
                 where the ISO won't boot otherwise (default: 4).
-f              Forced re-generation of all squashfs modules,
                 custom configurations and new initrd.img.
-m pkglst[,pkglst] Add modules defined by pkglists/<pkglst>,...
-r series[,series] Refresh only one or a few package series.
-s slackrepo_dir Directory containing Slackware repository.
-t <doc|mandoc> Trim the ISO (remove man and/or doc).
-v              Show debug/error output.
-z version      Define your Slackware version (default: current).
-G              Generate ISO file from existing directory tree
-H <hostname>   Hostname of the Live OS (default: darkstar).
-M              Add multilib (x86_64 only).
-O <outfile>    Custom filename for the ISO.
-R <runlevel>   Runlevel to boot into (default: 4).
```

```
-X Use xorriso instead of mkisofs/iso hybrid.
```

The script uses package repositories to create a Live ISO. The packages will be installed into a temporary directory.

In order to create a Live ISO for any of these variants, the package repositories that are required must be available as a local directory (this can be a network-mounted directory). *A local mirror of the Slackware repository is mandatory - you have to download these yourself.* Any other packages, i.e. those that are used from a 3rd party repository will be downloaded from a remote server as long as a rsync URL for the repository is configured in `./pkglists/*.conf`.

When all pre-reqs are met, you issue a single command to generate the ISO. The following example will create a pure Slackware Live Edition:

```
# ./make_slackware_live.sh
```

Another example which creates a MATE variant, configuring runlevel '3' as default and specifying a custom path for the Slackware package repository root (note that the script will look for a subdirectory "slackware64-current" below this directory if you are generating this ISO for slackware64-current):

```
# ./make_slackware_live.sh -d MATE -R 3 -s ~ftp/pub/Slackware
```

If you want to know what package sets are included in any of these Desktop Environments, run the following command:

```
# grep ^SEQ_ make_slackware_live.sh
```

for MATE, you will find:

```
SEQ_MSB="tagfile:a,ap,d,e,f,k,l,n,t,tcl,x,xap,xfce,y pkglist:slackextra,mate  
local:slackpkg+"
```

Which means that most of the Slackware package series (excepting kde and kdei) will be installed from their tagfiles, and on top of that two package lists are installed from the `pkglists/` subdirectory: `slackextra` and `mate`. Lastly, "slackpkg+" will be installed from a local directory.

## Using the Customization Feature of the Live OS

You can create your own custom Live OS by changing its characteristics in the configuration file "make\_slackware\_live.conf". Among the things you can change are:

- The name of the Desktop variant (the script itself knows "SLACKWARE", "PLASMA5", "XFCE", "MATE" and "CINNAMON"),
- The list(s) of packages used for your custom distribution,
- The name of the useraccount (by default that is "live"),
- The name of the distribution (by default that is "slackware"),
- And finally you can define a function "custom\_config()" where you can add all your custom post-installation steps that are not covered in the "make\_slackware\_live.sh" script itself.

This is the section in `make_slackware_live.conf` which deals with these customizations. Two variables are required if you want to create your own custom Live OS: **"LIVEDE"** and **"SEQ\_CUSTOM"**, the rest is optional (but useful nevertheless):

```
# REQUIRED:
# Define a new name for your own variant of Slackware Live Edition:
#LIVEDE="CINELERRA"

# REQUIRED:
# Define your own custom package sequence for a custom Live ISO.
# In this example you would need to create two files
"pkglists/cinelerra.conf"
# and "pkglists/cinelerra.lst" defining the package location and package
list
# respectively):
#SEQ_CUSTOM="min,xbase,xapbase,xfcebase,cinelerra"

# OPTIONAL:
# Use something else than the name "min",
# for the package list containing the generic kernel:
#MINLIST="min"

# OPTIONAL:
# Your custom distro name (will reflect in boot screen & filenames):
#DISTRO="cinelerra"

#OPTIONAL:
# Name of the 'live' user account in the Live image:
#LIVEUID="live"

# OPTIONAL:
# Marker used for finding the Slackware Live files:
#MARKER="CINELERRA"

# OPTIONAL:
# The filesystem label of the ISO:
#MEDIALABEL="CINELERRA"

# OPTIONAL:
# The ISO main directory:
#LIVEMAIN="cinelerra"

# OPTIONAL:
# Add your own Live OS customizations to the function custom_config() :
#custom_config() {
# # Add your own stuff here which is not covered in the main script:
#}
```

## Internals of Slackware Live Edition

### Overlayfs, squashfs

Overlayfs and squashfs are doing the real magic here. As explained earlier, the squashfs program takes a directory structure and compresses this into a single archive file. It does this in a special way, more like how mkisofs does this than how tar creates an archive. The resulting module can be loop-mounted to access the filesystem inside.

When you have several of these loop-mounted squashfs modules, each containing a fraction of the filesystem of the OS, you are going to stack these fractional filesystems on top of each other and thus assemble the complete filesystem (much like Tintin did in *The Secret of the Unicorn* when he overlaid several translucent pieces of parchment and looked through them to see the complete picture). Overlayfs is the driver that performs this 'overlying' of the fractional filesystems. Overlayfs can work with many read-only fractional filesystems and exactly one writable filesystem. The writable filesystem is what gives your Live OS the appearance that it is writing to a hard drive - the writes to the overlay filesystem are however done to RAM (in that case you have a real Live OS) or to a 'persistence' filesystem which is stored somewhere on a writable medium (a USB stick with 'persistence' is an example of this case).

### The initrd and its init script

The initrd used for the Slackware Live Edition is a standard Slackware initrd created with Slackware's "mkinitrd" command, with just one modification: its "init" script. The correct name for an 'initrd' nowadays is 'initramfs' by the way, short for "initial ram filesystem" because it contains the initial file system that gets loaded into kernel memory when your computer boots. The init script of an initrd is what prepares the root filesystem even before the actual OS starts. When the OS does start, it finds a root filesystem all ready to use. An example case is of course the LUKS-encrypted root filesystem. Another is a root filesystem stored on logical volumes (LVM). Some advance work is required to make the root filesystem accessible and start the real "init" program of the OS (PID 1). Just like the previous examples, you need a script in an initrd to assemble the root filesystem of a Live OS. Slackware's initrd does not support a Live environment, so the stock init script was expanded for use in liveslak.

What does the 'liveslak' init script do?

- It parses any boot parameters you entered (or were passed by syslinux/grub) and tries to make sense of them.
- It does some initialization just like the Slackware init (start udev, wait a bit for USB media to settle, load kernel modules, load custom keyboard mapping, initialize RAID etc) before it gets to the Slackware Live section.
- A RAM based filesystem is created which forms the base of all the rest.
- Using tools like 'blkid' and 'mount', the init script tries to locate the Live media. It uses blkid to search for the Live media's default filesystem label. If that fails (because you changed the label) it will use blkid to find all filesystem partitions available and mount them one by one until the Live partition is found.
- With the Live media located, the next step is to loop-mount the squashfs modules one by one and add them to the overlay filesystem in the correct order. If you specified the 'toram' boot parameter, then a module will first be copied into RAM before loop-mounting it. This allows you to remove the boot media after booting since the complete OS will run from RAM.

- Modules will be loaded in order:
  - first the system modules (core modules in the system/ subdirectory)
  - then the addon modules (in the addon/ directory). If you do not want an addon to be loaded, you can specify “noload=modulename” on the syslinux/grub boot commandline
  - last, the optional modules (in the optional/ subdirectory). By default an optional module is not loaded unless you force it by adding “load=modulename” to the boot commandline.
- Next, persistence will be configured if the Live OS was booted from a writable media such as a USB stick. The init script will first look for a directory in the root of the Live partition of the USB stick called “persistence” and use that to store persistent changes to the Live filesystem. If that directory does not exist but a file “persistence.img” is found, then that file will be loop-mounted and persistent changes to the Live filesystem will be written to this container file. The “persistence.img” container can be LUKS-encrypted in which case the init script will ask you for a passphrase to unlock it before mounting.
- The overlay filesystem is then finalized by adding the writable toplevel directory structure (either persistent or volatile).
- The complete RAM filesystem which underpins the overlay is made available to the user of the Live OS as “/mnt/live”
- The filesystem of the Live media is made available to the user of the Live OS as “/mnt/livemedia”. If the media is a USB stick then you will have write access to “/mnt/livemedia”.
- With the root filesystem assembled, the Live OS is configured before it actually boots:
  - if you specified “swap” on the boot commandline, any available swap partition will be added to “/etc/fstab” in the Live OS.
  - if you specified a custom keyboard layout for the console (and optionally another for X) by using the “kbd” and “xkb” boot parameters then these will be configured in “/etc/rc.d/rc.keymap” and “/etc/X11/xorg.conf.d/30-keyboard.conf” in the Live OS.
  - Same for any custom locale which was specified with the “locale” parameter, this will get added to “/etc/profile.d/lang.sh”.
  - If timezone and hardware clock were specified in the “tz” parameter, these will be configured in “/etc/localtime” and “/etc/hardwareclock”.
  - The boot parameters “livepw” and “rootpw” allow you to specify custom passwords for the 'live' and 'root' users; the defaults for these two are simply 'live' and 'root'. This is achieved by running the “chpasswd” command in the chrooted overlay so that a plain text password can be given as input.
  - The “hostname” boot parameter can be used to change the Live OS' hostname from its default “darkstar”. Configuration is written to “/etc/HOSTNAME” and “/etc/NetworkManager/NetworkManager.conf”.
  - If the “blacklist” boot parameter was specified, then the kernel modules mentioned as argument(s) will be added to a modprobe blacklist file “/etc/modprobe.d/BLACKLIST-live.conf”.
  - The “/var/lib/alsa/asound.state” file in the Live OS is removed to allow correct sound configuration on any computer where the Live media is booted.
  - The complete content of the /liveslak/rootcopy directory on the Live partition (may be empty) is copied to the filesystem root of the Live OS, potentially 'overwriting' files in the Live OS. Use the /liveslak/rootcopy to add customization to your Live OS when you run it off a USB stick.
  - And lastly but very importantly, any LUKS-encrypted container files are unlocked (init will ask you for the passphrase) and the filesystem(s) contained therein will be mounted in the Live OS. Currently, a LUKS-encrypted /home is supported. The files “/etc/fstab” and “/etc/crypttab” will be updated so that the Live OS will do the mounting and unmounting.
  - The init script will end by telling the kernel to swith to our new root filesystem (the

overlay) and start the Slackware init program (PID 1, /sbin/init).

- From this moment onward, you are booting a 'normal' Slackware system and the fact that this is actually running in RAM and not from your local harddisk is not noticeable.

## Slackware Live module format

A Slackware Live module contains a directory tree, which has been 'squashed' into a compressed archive file by the program "squashfs". The compression algorithm used is "xz" which explains the choice of the module's file extension ".sxz" meaning "squashed with xz".

Slackware Live Edition expects its modules to adhere to a particularly loose filename convention:

- The filename format is "NNNN-modname-\*.sxz", where 'N' is a digit and 'modname' must not contain a dash '-'.
  - The "modname" part is what you must specify in the boot parameters "load" and "noload".
  - Anything may be part of the '\*' but most commonly used is "\${VERSION}-\${ARCH}". The core modules in Slackware Live use the Slackware release as \${VERSION} and the Slackware architecture as \${ARCH}. For the modules in addons/ and optional/ subdirectories, \${VERSION} would commonly be the version of the program that is being made available in the module.
  - The four digits of a modulename have a meaning. Some ranges are claimed by the core OS, so please do not use them. Their prefixes are based on the package source:

```

0000 = contains the Slackware /boot directory
0010-0019 = packages installed from a Slackware tagfile (a,ap,d,
... , y series)
0020-0029 = packages installed from a package list as found in the
./pkglists subdirectory of the liveslak sources (min, xbase, xabase,
xfcebase etc)
0030-0039 = a 'local' package, i.e. a package found in subdirectory
./local or ./local64 (depending on architecture)
0099 = liveslak configuration module (contaning all the
customizations that change the installed packages into a usable Live
OS)

```

- Other ranges are free to be used. Note that order in which the filesystem of the Live OS is assembled by overlaying the squashed directory trees depends on the module numbering. So if you have modules that you want to have loaded in specific order, just ensure that their filenames have ascending numbers.

1. Example of a core module: 0099-slackware\_zzzconf-14.2-x86\_64.sxz
2. Example of an optional module: 0060-nvidia-352.79\_4.4.1-current-x86\_64.sxz

## Other Slackware based Live distros

Naturally, there have been many who went before me, and since I started as a n00b in Linux Live land, I have learnt a lot about how a Live distro works from playing with these other Slackware-based Live distros. Allow me to name them, and show respect:

## SLAX

Website: <https://www.slax.org/>

SLAX was the original Live variant of Slackware. The linux-live scripts which are used to create a SLAX ISO were generalized so that they can create a Live version of any OS that is already installed to a harddrive. SLAX development stalled a couple of years ago but its creator seems to have warmed up recently.

The Live functionality of SLAX is based on aufs and unionfs which requires a custom-built kernel with aufs support compiled-in. It is small and has its boot scripts tweaked for startup speed.

## Porteus

Website: <http://www.porteus.org/>

Porteus was created as a fork of SLAX by the SLAX community when the development of SLAX seemed to have ended. Porteus has an active user community where it's "all about the modules". The use of aufs instead of overlayfs allows Porteus (like SLAX) to add and remove squashfs modules in the running Live system on the fly, which sparked the development of a lot of community modules. It looks like the next generation of Porteus will be based on Arch Linux instead of Slackware: this has to do with the original Porteus developer leaving the team.

## Salix Live

Website: <http://www.salixos.org/download.html>

Salix is a distribution based on Slackware with its own philosophy of "one tool per task" reducing the number of packages a lot, compared to its parent Slackware distro. Salix has implemented dependency checking in its package management tool. Live editions of Salix are available in several editions, each built around and focused on a different Desktop Environment or Window Manager. Live editions are available for XFCE and MATE.

## Slackel

Website: <http://www.slackel.gr/>

Slackel is a Greek distro based on both Slackware and Salix. It comes in three flavors, each of which has a Live variant: KDE4, Openbox and Fluxbox. The Live scripts are a modification of Salix-Live.

## SlackEX

Website: <http://slackex.exton.net/>

A website offering Live versions based on many regular Linux distributions. The SlackEX version is loosely based on Slackware with a custom kernel and some tools that are not part of Slackware itself.

I was unable to find the sources for this live distro.

## Liveslak Sources

Slackware Live Edition is created by the 'liveslak' scripts developed and maintained by Eric Hameleers aka Alien BOB [alien@slackware.com](mailto:alien@slackware.com).

- Git repository: <git://bear.alienbase.nl/liveslak.git>
- Git repository (browsable): <http://bear.alienbase.nl/cgit/liveslak/>
- Download mirror: <http://www.slackware.com/~alien/liveslak/>

## Sources

- Original source: <http://bear.alienbase.nl/cgit/liveslak/tree/README.txt>
- Originally written by [Eric Hameleers](#)

[slackware](#), [live](#), [author alienbob](#)

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