

# Arch Linux Full Disk Encryption

Full Disk Encryption is probable one of the most important things to do first, when setting up a new system in a world in which #BigBrother is always watching you. The issue we had was, having a keyfile which is needed to decrypt your system is nice, but if its [the keyfile] unencrypted on a USB device it doesn't satisfy our paranoia. So the solution is to encrypt to USB device as well; with a passphrase. And that's what we're going to show here.

## Requirements

- [Arch Linux Download](#)
- Computer

## USB Device Installation

Write the ISO to a removable flash drive. You can also use the traditional way and simply burn the ISO on a CD/DVD.

```
<sxh bash;> ~$: shasum archlinux-$VERSION-dual.iso ~$: dd if=archlinux-$VERSION-dual.iso  
of=/dev/$DEVICE bs=8192 </sxh>
```

## Booting

```
<sxh bash;> # if necessary reconfigure your keyboard layout root@archiso ~ # loadkeys fr # check  
for network connectivity root@archiso ~ # ping 8.8.8.8 # request IP address root@archiso ~ #  
ifconfig -a root@archiso ~ # dhclient $NIC </sxh>
```

## tmpfs (Paranoia)

```
<sxh> root@archiso ~ # fdisk -l | grep Disk root@archiso ~ # mkdir ./mytmpfs root@archiso ~ #  
mount tmpfs ./mytmpfs -t tmpfs -o size=32m root@archiso ~ # cd ./mytmpfs root@archiso ~ # dd  
if=/dev/urandom of=secretkey bs=1024 count=4 root@archiso ~ # mkdir /mnt/boot && mkdir  
/mnt/home </sxh>
```

## Partitioning

The partitioning structure of a disk is every users own choice, that's why we recommend reading the paragraph [Partition Scheme](#) in order to get a short introduction about the subject and make up your mind.

Get a pen and a piece of paper and start-off drawing your structure. When done, continue to the next paragraph.

## GPT

Basically there exist two "formats" of partitioning a disk: MBR and GPT. As MBR is from the last century and has many disadvantages in comparison with [GTP](#), we are going to use the latter one. For more detailed information about MBR and other possibility, please refer to the [Partion table](#) paragraph.

```
<sxh> # gdisk disk-device </sxh>
```

You will be thrown in a own commandline of the gdisk program, so proceed as follows:

Step	Command	Explanation
1	o	Create a new GUID partition table.
2	n	Create a new partition. (All partition with GPT are primary)
X	w	Write the partition table to disk.
Y	q	Exit gdisk commandline.

## Encryption

```
<sxh bash; title: with keyfile> ~$ cryptsetup -v -cipher aes-xts-plain64 -key-size 512 -hash sha512 -iter-time 5000 -use-urandom luksFormat <device> keyfile ~$ cryptsetup luksOpen -d keyfile /dev/$DEVICE root ~$ cryptsetup luksOpen -d keyfile /dev/$DEVICE home ~$ cfdisk /dev/$DEVICE ~$ cryptsetup -c aes-xts-plain -y -s 512 luksFormat /dev/$DEVICE # USB storage device ~$ mkfs.vfat -F 32 -l /dev/mapper/bootdevice ~$ cfdisk /dev/$DEVICE1 # make it bootable </sxh>
```

```
<sxh bash; title: with password> ~$ cryptsetup -v -cipher aes-xts-plain64 -key-size 512 -hash sha512 -iter-time 5000 -use-urandom -verify-passphrase luksFormat <device> ~$ cryptsetup luksOpen /dev/$DEVICE $CRYPTSETUP_DEVICE_NAME ~$ mkfs.btrfs /dev/mapper/$CRYPTSETUP_DEVICE_NAME ~$ mount /dev/mapper/$CRYPTSETUP_DEVICE_NAME /mnt </sxh>
```

## /boot partition

```
<sxh bash; title: on disk boot device> ~$ mkfs.ext3 -L boot /dev/$BOOTDEVICE # DOS; primary partition + bootable ~$ cfdisk /dev/$BOOTDEVICE ~$ mount /dev/$BOOTDEVICE /mnt/boot </sxh>
```

```
<sxh bash; title: external boot device> ~$ mkfs.ext3 -L boot /dev/$BOOTDEVICE ~$ cfdisk /dev/$BOOTDEVICE # DOS; primary partition + bootable ~$ mkfs.ext3 -L boot /dev/$BOOTDEVICE ~$ mount /dev/$BOOTDEVICE /mnt/boot </sxh>
```

## Mounting

```
<sxh bash; title: mounting> ~$ mkdir /mnt/boot ~$ mount /dev/mapper/$CRYPTSETUP_DEVICE_NAME /mnt ~$ mount /dev/$BOOTDEVICE /mnt/boot </sxh>
```

## Bootstrapping

```
<sxh bash;> ~$ pacstrap -i /mnt base base-devel ~$ genfstab -U /mnt > /mnt/etc/fstab ~$ arch-chroot /mnt /bin/bash ~$ nano /etc/locale.gen ~$ locale-gen ~$ echo LANG=en_IE.UTF-8 > /etc/locale.conf ~$ nano /etc/vconsole.conf # KEYMAP=fr ~$ ln -sf /usr/share/zoneinfo/$CONTINENT/$COUNTRY /etc/localtime ~$ hwclock --systohc --utc ~$ echo $HOSTNAME > /etc/hostname ~$ nano /etc/mkinitcpio.conf # add: keymap keyboard encrypt before filesystem in the HOOKS variable ~$ mkinitcpio -p linux ~$ passwd root </sxh>
```

## syslinux

```
<sxh bash;> ~$ pacman -S syslinux gptfdisk ~$ syslinux-install_update -iam ~$ nano /boot/syslinux/syslinux.cfg # APPEND root=/dev/mapper/group-name cryptdevice=/dev/sda2:name rw </sxh>
```

## Unmount & Reboot

Good luck!

```
<sxh bash;> ~$ exit ~$ umount -R /mnt </sxh>
```

## Troubleshooting

Tiny troubles might pop up. The few below have a tendency to occur due to human interaction failure. ;)

### cryptsetup failed

Command failed with code 22: Invalid argument

Enter the 'yes' in capslock: YES and hit Enter?

### syslinux

Error: /boot/syslinux is empty!

## Is /boot mounted?

Reinstall syslinux package.

## Write-Protected

If mount /dev/bootdevice /mnt gives you an error about write protection; ask yourself if you have formatted the relative partition in the first place.

## Repairing boot partition

```
<sxh bash;> ~$ cryptsetup luksOpen /dev/$ROOTPARTITION root ~$ mount /dev/mapper/root /mnt
~$ mkfs.ext2 /dev/$BOOTPARTITION ~$ mount /dev/$BOOTPARTITION /mnt/boot ~$ genfstab -U /mnt
> /mnt/etc/fstab ~$ arch-chroot /mnt /bin/bash ~$ pacman -R syslinux ~$ pacman -Syy syslinux ~$
syslinux-install_update -iam ~$ nano /boot/syslinux/syslinux.cfg # APPEND root=/dev/mapper/group-
name cryptdevice=/dev/sda2:name rw ~$ pacman -S linux ~$ exit ~$ umount -R /mnt </sxh>
```

## References

- [https://wiki.archlinux.org/index.php/Dm-crypt/Drive\\_preparation](https://wiki.archlinux.org/index.php/Dm-crypt/Drive_preparation)
- [https://wiki.archlinux.org/index.php/Partitioning#Using\\_GPT\\_-\\_modern\\_method](https://wiki.archlinux.org/index.php/Partitioning#Using_GPT_-_modern_method)
- [http://fedoraproject.org/wiki/Disk\\_Encryption\\_User\\_Guide](http://fedoraproject.org/wiki/Disk_Encryption_User_Guide)

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