# 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.



The **Paranoia** paragraphs haven't been finished just yet.

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

<sxh bash; title: with password> root@archiso ~ # cryptsetup -v –cipher aes-xts-plain64 –key-size 512 –hash sha512 –iter-time 5000 –use-urandom –verify-passphrase luksFormat <device> root@archiso ~ # cryptsetup luksOpen /dev/$DEVICE $CRYPTSETUP_DEVICE_NAME root@archiso ~ # mkfs.btrfs /dev/mapper/$CRYPTSETUP_DEVICE_NAME root@archiso ~ # 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;> root@archiso ~ # pacstrap -i /mnt base base-devel root@archiso ~ # genfstab -U /mnt > /mnt/etc/fstab root@archiso ~ # arch-chroot /mnt /bin/bash root@archiso ~ # nano /etc/locale.gen root@archiso ~ # locale-gen root@archiso ~ # echo LANG=en_IE.UTF-8 > /etc/locale.conf root@archiso ~ # nano /etc/vconsole.conf # KEYMAP=fr root@archiso ~ # ln -sf /usr/share/zoneinfo/$CONTINENT/$COUNTRY /etc/localtime root@archiso ~ # hwclock –systohc –utc root@archiso ~ # echo $HOSTNAME > /etc/hostname root@archiso ~ # nano /etc/mkinitcpio.conf # add: keymap keyboard encrypt **before** filesystem in the HOOKS variable root@archiso ~ # mkinitcpio -p linux root@archiso ~ # passwd root root@archiso ~ # pacman -S syslinux root@archiso ~ # syslinux-install_update -iam root@archiso ~ # nano /boot/syslinux/syslinux.cfg # APPEND root=/dev/mapper/group-name cryptdevice=/dev/sda2:name rw root@archiso ~ # exit root@archiso ~ # umount -R /mnt

</sxh>

# Troubleshooting

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

## References

- https://wiki.archlinux.org/index.php/Dm-crypt/Drive_preparation
- https://wiki.archlinux.org/index.php/Partitioning#Using_GPT_-_modern_method
- http://fedoraproject.org/wiki/Disk_Encryption_User_Guide

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