

Unwrapping the Ubuntu Live CD

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Abstract

The Ubuntu live CD is elegantly simple. It can be unwrapped in three quick steps.

- 1) Extract the boot file system to understand stage 1 and 2 booting
- 2) Extract the initrd file system to understand loading the kernel and system initialization for a live CD environment
- 3) Extract the root file system to learn how the live system works

Preparations:

1. Download a Ubuntu ISO
2. Create three working plus one temporary directories
 - fs-boot-ubuntu
 - fs-initrd-ubuntu
 - fs-root-ubuntu
 - fs-tmp

Step 1: Extract the Boot File System

The Ubuntu CD ISO contains a boot loader in the /isolinux directory and kernel, initial ram disk and a squashed root file system in the /casper directory.

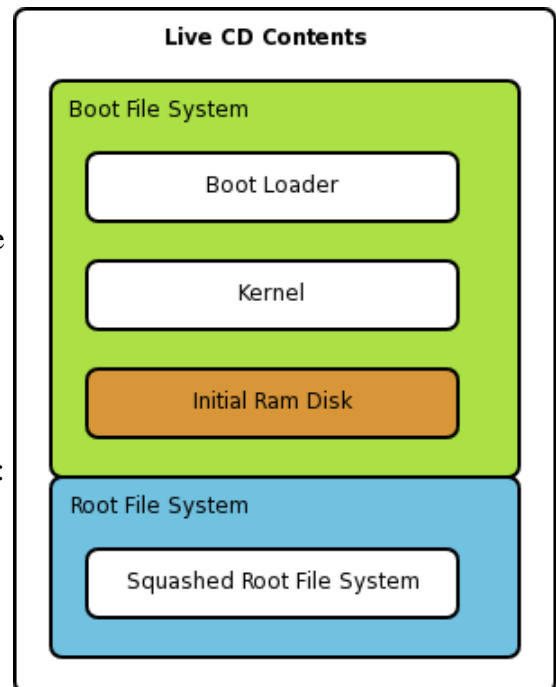
In this case the boot file system is defined as the kernel and initial ram disk file in the /casper directory plus the boot loader contents of the /isolinux directory. For simplicity and because the other files are not important here we'll expand the definition to include everything except the squashed root file in the /casper directory.

To inspect the Ubuntu ISO boot file system (or any other LiveCD for that matter) mount and copy the contents of the CD into the fs-boot working directory.

Taking a quick look inside, we see the following arrangement:

- Boot loader is isolinux located in the /isolinux directory
- Kernel is located in /casper directory
- Initial ram disk is located in the /casper directory
- Root file system is of type squashfs and is located in the /casper directory
- LiveCD environment is activated with the command `boot=casper`, which runs the casper suite of startup scripts

Assuming we are working within a root shell, mount the ISO file to a temporary working directory to



begin extracting its contents.

```
% mount -o loop ubuntu-6.10-desktop-i386.iso fs-tmp/
```

Copy out the boot file system contents, excluding the root file system

```
% rsync --exclude=/casper/filesystem.squashfs -a fs-tmp fs-boot-ubuntu
```

Copy out the root file system for extraction later (it's over 600MByte, so this takes a while)

```
% cp fs-tmp/casper/filesystem.squashfs .
```

Unmount the ISO and you have a working boot disk in fs-boot

```
% umount fs-tmp
```

Step 2: Extract the Initial RAM Disk (initrd, initramfs or initrd.sys)

Within the boot file system is the special initial ram disk file. In different distributions this is referred to by various names, but is easily identified from the kernel boot parameters (it's also typically in the same directory as the kernel.)

The initial RAM disk is typically a compressed CPIO file, as is the case on the Ubuntu Live-CD. To inspect it, uncompress it first, then extract the contents into the fs-initrd working directory with the cpio program.

Copy the initial ram disk from our existing fs-boot working directory to extract it

```
% cp fs-boot-ubuntu/casper/initrd.gz fs-tmp/
```

```
% cd fs-tmp
```

Uncompress the image before working on it

```
fs-tmp% gunzip initrd.gz
```

The image is a cpio type, so we'll need to use cpio to extract it

```
fs-tmp% cpio -iv < initrd
```

We can discard the original file now

```
fs-tmp% rm initrd
```

and move the contents to our working directory for later inspection

```
fs-tmp% mv * ../fs-initrd-ubuntu/
```

```
fs-tmp% cd ..
```

Step 3: Extract the Live CD Root file system

Most space on the CD is taken up by the Live-CD root file system. This is either a compressed CPIO or Squashed file system. The contents of the Live-CD root file system are relatively indistinguishable from any typical linux installation, and there is little of unique interest to discover on the CD that is not already available on a working hard disk installation of linux.

To extract the CD root file system, mount and copy the contents of the squashed file system into the fs-root working directory. To do this, we must specify the special file type when mounting the loopback device

```
% mount -o loop -t squashfs filesystem.squashfs fs-tmp/
```

```
% cp -a fs-tmp/* fs-root-ubuntu/
```

Unmount the temporary directory and remove the image to clean up

```
% umount fs-tmp
```

```
% rm filesystem.squashfs
```

You now have three working directories, each containing their respective file systems and ready for inspection.