

# Batocera's File Partitions

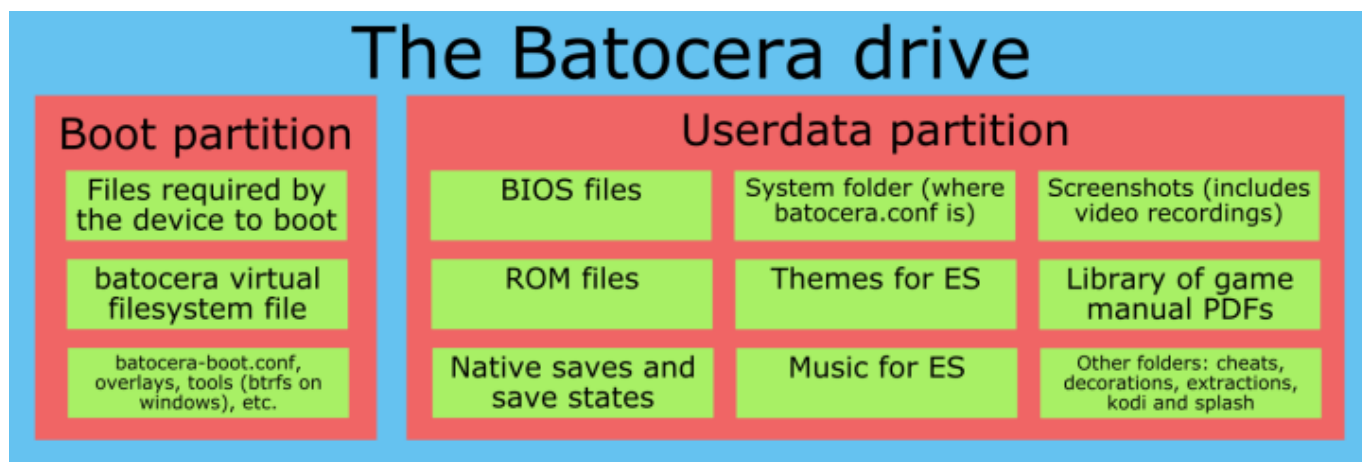
## Userdata filesystem options

It's helpful to become familiar with how Batocera has its partitions laid out first to better understand what you're accessing and where they are located.

Batocera uses two main partitions: the **boot** partition and the **userdata** partition.

The **boot** partition is what appears as the FAT32 partition when you plug the drive into another system (this will be the only visible partition to Windows by default). This is where Batocera contains all the files necessary to boot Batocera on your device. While Batocera is running, it is mounted to the /boot/ folder, but its original location is simply / on the FAT32 partition. It is not usually necessary to edit this partition (except for editing a few settings in the batocera-boot.conf file if required).

The **userdata** partition contains "the rest", all the ROMs, BIOS files, saves, configuration (including batocera.conf), etc. This is referred to as either userdata or share interchangeably (in reference to it being the default path the network share points to), they both mean one and the same thing. This is designed to be portable between all versions of Batocera, even Batocera builds running on different platforms (granted, weaker platforms like SBCs won't magically gain the ability to play ROMs for emulators they don't have). Refer to the attached image below:



## Using an alternative filesystem for userdata

You are free to use a variety of filesystems for the userdata partition. The best filesystem to use depends on your situation and what capabilities you need/restrictions you can deal with. The boot partition should not be reformatted to a different filesystem (your particular platform may depend on it).

Here are the options available for the **userdata** partition:

- **ext4** is the default userdata partition filesystem. If you own other Linux systems, you're probably already comfortable with it as they have access built-in. No major restrictions, except this cannot be read directly by Windows by default, [though it is still possible to add files to this file system from Windows using a special program/drivers](#). This issue can be worked around if

[you have network access.](#)

- **btrfs** is a newer option. If you have Windows machines, Batocera comes with the `btrfs_for_windows` driver on the boot partition to allow Windows machines to read a BTRFS userdata partition. This issue can be worked around [if you have network access](#). No restriction when using BTRFS, except you can't read it natively with MacOS. Performs *slightly* slower than **ext4**, but is better at protecting corruption from files such as during a power cut mid-transfer.
- **NTFS** is an OK option - Windows, MacOS and most Linux distributions can directly read NTFS just fine. Sophisticated systems (such as WINE for Windows applications, Steam, Cemu for Wii U, Future Pinball, Flatpak, etc.) may have issues when using this due to certain file attributes not being properly stored and no compatibility with symlinks when being read by Linux. Has no real file size restrictions (that you'd feasibly run into).
- **FAT32** and **extFAT** are *outdated filesystems*. Yes, they are well supported under most OS's (you bet, those filesystems are over forty years old!) but they have restrictions in terms of maximum file size (FAT32 cannot store files larger than 4GB, which most 6th gen and above console ROMs exceed) and the ability to support the exec bit required to run certain Linux applications. It will also limit the use of certain emulators and systems that rely on features like symbolic links or special character filename handling, neither of which are possible with FAT32 or exFAT. Amiga or Wine/Windows are popular systems that won't work well with these filesystems. However, these systems involve the least amount of writes when creating files, therefore would increase the longevity of short-lifespan storage such as USB flash drives. Although this becomes less an issue as flash storage lifespan improves over time of manufacture.

To summarize in a table:

Filesystem	Writable by Linux OSes?	Writable by Windows?	Writable by MacOS?	Issues with emulators	File size restrictions	Notes
<b>ext4</b>	Yes	Not by default	No	None	None you'd feasibly reach	Some protection against file corruption.
<b>btrfs</b>	Yes	Not by default	No	None	None you'd feasibly reach	More protection against file corruption, but <i>slightly</i> slower than <b>ext4</b> .
<b>NTFS</b>	Yes	Yes	Not by default	Some (any that rely on symlinks, special character/case-sensitive filenames or certain permission bits)	None you'd feasibly reach	Minimal protection against file corruption.

Filesystem	Writable by Linux OSes?	Writable by Windows?	Writable by MacOS?	Issues with emulators	File size restrictions	Notes
<b>exFAT</b>	Yes	Yes	Yes	Many (really, only 4th gen and below <a href="#">systems</a> are guaranteed to still be functional)	None you'd feasibly reach	No protection against file corruption. Is however the best for USB flash storage, as it uses the least amount of writes (increasing longevity of the drive).
<b>FAT32</b>	Yes	Yes	Yes	Many (really, only 4th gen and below <a href="#">systems</a> are guaranteed to still be functional)	4GB (lower than DVD disc images)	No protection against file corruption. Not recommended under any circumstances, <b>exFAT</b> is superior in every way.

You can reformat an external drive to **ext4**, **BTRFS** or **exFAT** using Batocera's built-in formatting tools. Go to **SYSTEM SETTINGS** → **DEVELOPER** → **FORMAT A DISK**. Of course, when you format a partition, **you lose everything that was on it**. So, backup your userdata (ROMs, saves, etc.) before doing this!

If you're handy with formatting partitions, you can always format the partitions yourself and manually install Batocera.

## Buildroot

Batocera.linux is based on [buildroot](#). You can see buildroot as a minimal Linux distribution which maintains base packages. Its focus is on being firmware for embedded systems, but is flexible enough to allow for more complex projects such as Batocera. Batocera.linux mainly includes extra packages not available by default in Buildroot (emulators, front-end GUI, additional drivers for devices, etc.) and configuration.

More information about Buildroot can be found here: <https://buildroot.org>.

## The Batocera firmware and its overlays

The partition named BATOCERA visible on any computer under Windows, MacOS or Linux is the **system**. It is a partition formatted in FAT32, a filesystem supported by almost every OS and boot system (BIOS legacy or UEFI).

The three most important files on the boot partition are:

- `linux`, the technical system (about 10 MB)
- `batocera`, the software system containing all the programs (about 2 GB compressed)
- `initrd.gz` or `uInitrd`, the loader (about 600 kB)

Upgrading the system means mainly that these three files are getting upgraded. There may be some other files depending on the architecture.

The file `batocera` can be seen like a firmware, you cannot directly modify it. However the architecture is a bit more complex and allows you to add “adjustments” to modify the firmware without recompiling everything: `batocera.linux` supports and uses by default [overlayfs](#). The real system is the firmware (the file `batocera`) and a filesystem in memory initialized with the file `overlay` if it exists. The overlay is an in-memory filesystem and not directly the `overlay` file because under Linux, you cannot properly unmount the root filesystem, mainly when it's a complex root from several filesystems.

As a general rule, the file `overlay` doesn't exist, unless it's created by the script `batocera-save-overlay` if a user or developer customizes the system.

```
+-----+
| TMPFS, writable | --> must be saved explicitly on
| /boot/overlay  |
+-----+
| firmware (squashfs), read only |
+-----+
```

More details on `overlayfs` can be found here : <http://embedded-computing.com/guest-blogs/understand-what-an-overlayfs-is-and-how-it-works>

## SD card / EMMC / USB key / Hard drive

When you create the card to run `batocera.linux`, the card is more complex than a basic card, and it's dependent on the architecture. It's why you need a special tool to burn it.

- BEFORE BOOT: these are technical files to be able to access the BOOT partition and run the Linux kernel.
- BOOT: this partition is visible on Windows. This is where the `batocera.linux` system is.
- FREE: this free space is filled with a SHARE partition on the first boot to save all the user data (ROMs and ancillary files like screenshots, video snaps and so on).
- SHARE: this partition replaces FREE at the first boot. It is partitioned as EXT4 by default, but you have other options depending on the usual OS you have on your other computers. See the chapter “Userdata file systems” below.

### RPI SD CARD

```
      1                1263
+-----+-----+-----+-----+
| MBR |                | BOOT |                | FREE |
+-----+-----+-----+-----+
```

```

+-----+-----+-----+-----+
      512                631K

```

### X86/X86\_64 USB KEY/HARD DRIVE

```

      1                1263
+-----+-----+-----+-----+
| GPT | SYSLINUX          | BOOT |     FREE     |
+-----+-----+-----+-----+
      512                631K

```

### XU4 SD/EMMC CARD

```

      1      31      63          719      1231      1263
+-----+-----+-----+-----+-----+-----+-----+
-+
| MBR | bl1 | bl2 |  uboot  |  tzsw  |           |  BOOT  |     FREE
|
+-----+-----+-----+-----+-----+-----+-----+
-+
      512      15K      31K          359K      615K      631K          1.2G

```

### C2 SD CARD

```

      1      97      1281
+-----+-----+-----+-----+-----+
| MBR | bl1 |  uboot  |  BOOT  |     FREE     |
+-----+-----+-----+-----+-----+
      512      48K          640K

```



The rest.

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