

Disc image compression

Systems from the [5th](#) and [6th console generation](#) often use optical discs like CD or DVD to store game data. Disc image sizes range from 700 MB (CD), 1.4 GB (GC Mini-DVD), 4.7 GB (single-layered DVD) and even 25 GB (Blu-Ray) for newer systems. Often times only a fraction of the actual disc size is used for game data and the rest is filled with dummy data to be optimized for read access by the optical drive laser.



The [Super Mario 25th Anniversary](#) Wii disc itself is a 4.7GB, when really the actual game data is only a single SNES ROM (12 MB of useful data). Disc compression helps to save more than 99% of hard disk space and can speed up loading time on emulators.

On the other side systems like the [Sony PlayStation](#) often use multi-track images (data and audio tracks) containing several *.bin and *.cue files which can become cumbersome in daily usage with Batocera or other emulation front-ends.

Choosing the right disc image compression can help in both cases and should be the preferred format for most of the disc based systems. This page will help you to find the suitable compression method and tool set.



If not familiar with using command line tools there are also GUI-based helper tools available:

- **Windows:** [namDHC](#)
- **Linux:** [game-converter](#)

CHD

CHD is short for *(C)ompressed (H)unks of (D)ata*. It is a lossless compression format originally developed for MAME, for the hard-drive contents of certain arcade machines. It has since been used in several other emulators as a means of storing disc based game data. It compresses the contents of a disc image to a handy single .chd file. Here's a comparison between 7z file compression and CHD (originally an 700 MB image):



Sydney 2000 (USA).7z
7Z File
432 MB



Sydney 2000 (USA).chd
CHD File
371 MB

Supported systems

CHD is supported by many systems and the recommended format for the following systems:

- [3do](#)
- [dreamcast](#)
- [segacd](#)
- [neogeocd](#)
- [pcenginecd](#)
- [psx](#)
- [ps2](#) (available with Batocera v31)
- [saturn](#)



If you have one of the PAL PlayStation games that features LibCrypt copy protection, you have a `.sbi` file in addition to the `.bin/.cue` file. The CHD creation process doesn't process the `.sbi` file. Therefore you will need the `.sbi` file in the same directory as the `.chd` file for the game to run.

Installing chdman

CHD files can be created using the `chdman` program, developed by the [MAME](#) project. Its installation process varies based on which operating system is being used to create the files.

Batocera

`chdman` is already included with Batocera. It can only be summoned by its command line interface though. [Open up a terminal](#) and run `/usr/bin/mame/chdman` to use it. For instructions further on in this document, just replace `chdman` with `/usr/bin/mame/chdman`.

Windows

The [official MAME package](#) contains a copy of the executable file. You can download the EXE file and open it up like an archive with [7-zip](#), then extract `chdman.exe`.

Linux

On most Linux based distributions, this is included with the `mame-tools` package.

MacOS

On macOS use [brew](#) to install the `rom-tools` package.

Creating CHDs

chdman is a command line application. It can create a .chd file by targeting *.cue, *.iso or *.gdi files.

If there is a *.cue file available, use this for creating the .chd. Otherwise choose the *.iso (Sony PlayStation 2 DVDs) or *.gdi (Dreamcast GD-ROM) file. Note that GameCube/Wii have their [own compressed format](#).

Open the command line in either Windows with cmd.exe or in Linux with your favorite terminal emulator. Put both chdman and the game file in the same folder, navigate to that folder in your terminal and run:

```
chdman createdcd -i <game.cue> -o <game.chd>
```

For example, if the file structure was like so:

```
/totally-rad-folder-name/  
├─ chdman  
├─ Spiderman.cue  
└─ Spiderman.bin
```

Switch to the folder first with `cd /totally-rad-folder-name` then run:

```
chdman createdcd -i Spiderman.cue -o Spiderman.chd
```

Then make yourself a cup of tea. This can take a while. After that you'll have <game.chd> and you can delete the *.cue/*.bin, *.iso or *.gdi/*.bin file(s).

The compression is fully lossless so it is possible to redo the compression and get the original files back:

```
chdman extractcd -i <game.chd> -o <game.cue>
```

CHD batch converting

You can batch convert all files in a directory like following (replace .cue with the correct file type you want to convert):

Linux/macOS:

Navigate to the folder that has all your game ROMs and run the following for loop to convert all the files in one go:

```
for i in *.cue; do chdman createdcd -i "${i}" -o "${i%.*}.chd"; done
```

replacing *.cue as needed. If you're converting a lot of files, practice some yoga poses. This may take a while.

Here's a command to convert all the games in the current folder and recursive folders to CHD:

For *.cue:

```
find . -name "*cue" -exec chdman createdcd -i {} -o {}.chd \;
```

For *.iso:

```
find . -name "*iso" -exec chdman createdcd -i {} -o {}.chd \;
```

For *.gdi:

```
find . -name "*gdi" -exec chdman createdcd -i {} -o {}.chd \;
```

Windows:

Just place the chdman.exe into the directory where you have your disc images.

Here's some handy BAT scripts you can just double-click to instantly convert all the games in the current folder to CHD:

For *.cue:

[cue-to-chd.bat](#)

```
for /r %%i in (*.cue) do chdman createdcd -i "%%i" -o "%%~ni.chd"
```

For *.iso:

[iso-to-chd.bat](#)

```
for /r %%i in (*.iso) do chdman createdcd -i "%%i" -o "%%~ni.chd"
```

For *.gdi:

[gdi-to-chd.bat](#)

```
for /r %%i in (*.gdi) do chdman createdcd -i "%%i" -o "%%~ni.chd"
```

Or combine both: `for /r i in (*.cue, *.gdi, *.iso) do chdman createdcd -i "i" -o "%%~ni.chd"`

If you're converting a lot of files, play some tunes on your guitar. This may take a while.

CSO

CSO is a compression method for the ISO image format and is the short form for *Compressed ISO*. It also called CISO.

It was originally used to compress PlayStation Portable 🎮 [UMD](#) disc images.

Supported systems

CSO/CISO is supported by multiple systems and the recommended format for the following systems:

- [ps2](#) (prior to Batocera v31)
- [psp](#)



The Wii/Gamecube also support a CSO/CISO format, that is unrelated to the compression method explained here. More information can be found at the [wit: Wiimms ISO Tool](#).

Creating CSOs

With MaxCSO



If not familiar with using command line tools, a GUI-based helper tool is available:

- **Windows:** <https://github.com/sethfoxen/maxcsoGUI/releases> (requires the [maxcso](#) executable to be copied to the same folder to function)

There are different tools to create CSO files. [maxcso](#) is a free command line application that is available to Linux, macOS and Windows.

To compress an ISO file just use:

```
maxcso <game.iso>
```

This will create a `<game.cso>` file in the same folder.

The compression is fully lossless so it is possible to redo the compression and get the original files back:

```
maxcso --decompress <game.cso>
```

MaxCSO batch converting

Batch converting can be done with a simple for loop.

Linux/macOS:

```
for i in *.iso; do maxcso "${i}"; done
```

Windows:

```
for %i in (*.iso) do maxcso.exe "%i"
```

With ciso

If not familiar with using command line tools, a GUI-based helper tool is available:



- **Windows:** <https://sites.google.com/site/theleecherman/cisomulticompressor>
- **Linux:** Actually there is none, but you can run cisomulticompressor in Wine with the necessary dependencies in a Debian-based distro:

```
sudo apt update
sudo apt install mono-complete libmono-microsoft*
sudo apt install wine1.4
```

ciso is a command line utility for converting PSP iso files to cso. It is notable for being more compatible with a real PSP than MaxCSO.

Compress an ISO to CSO:

```
ciso <level> game.iso game.cso
```

Where <level> is the compression level, from 1 (fast, poor compression) to 9 (slow, high compression).

To decompress a CSO to ISO:

```
ciso 0 game.cso game.iso
```

Here, the "level" is 0, that is "no compression".

ciso batch converting

Batch converting can be done with a simple for loop.

Linux/MacOS:

```
for i in *.iso; do ciso 9 "${i}" "${i}.ciso; done
```

Windows:

```
for %i in (*.iso) do ciso.exe 9 "%i" "%i".ciso
```

PBP

PBP supports multiple discs and is compatible with .BIN+.CUE, .IMG image formats.

Good to compress PSX multi-discs into one unique PBP file.



The compression is NOT fully lossless, it is possible to redo the decompression of a .PBP file and get the .CUE+.BIN files, but they are not the same originals used before but a complete new file!

Supported systems

PBP is supported by multiple systems:

- [psp](#)
- [psx](#)

Creating PBPs

With PSX2PSP

- **Windows:** <https://psp.brewology.com/downloads/download.php?id=9697>
- **Linux:** Actually there is none, but you can run PSX2PSP in Wine or Lutris

PSX2PSP is a program for Windows that enables you to convert your PlayStation backup disc images (.ISO, .IMG and .CUE+.BIN), also multi-discs, to a single PBP file format.

Open the PSX2PSP.exe application:

Windows:

```
PSX2PSP.exe /theme Opens program in theme mode.  
PSX2PSP.exe /classic Opens program in classic mode.  
PSX2PSP.exe /batch Opens program in batch mode.  
PSX2PSP.exe "c:\file.iso" Opens c:\file.iso.
```

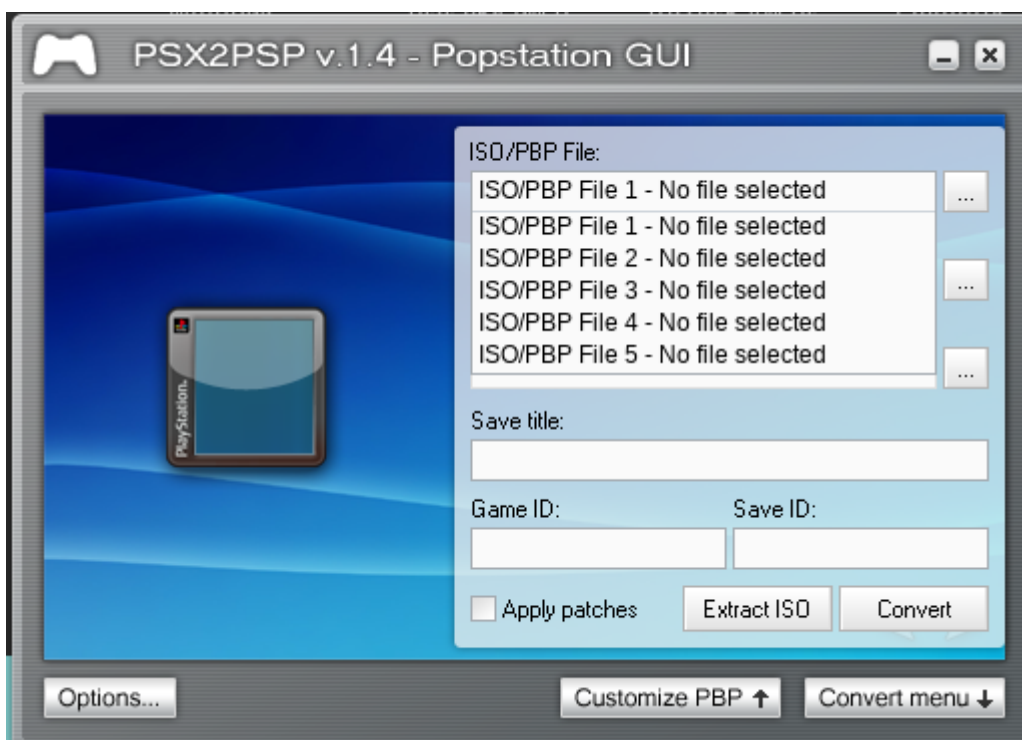
Linux:

```
wine PSX2PSP.exe
```

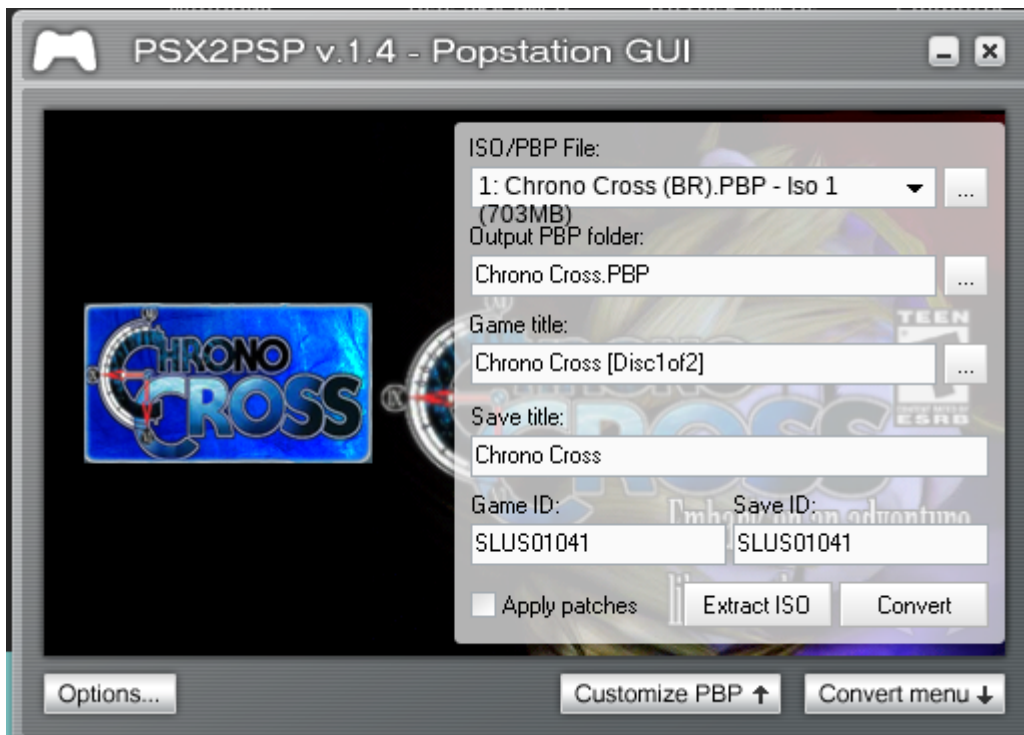
or open it with Lutris



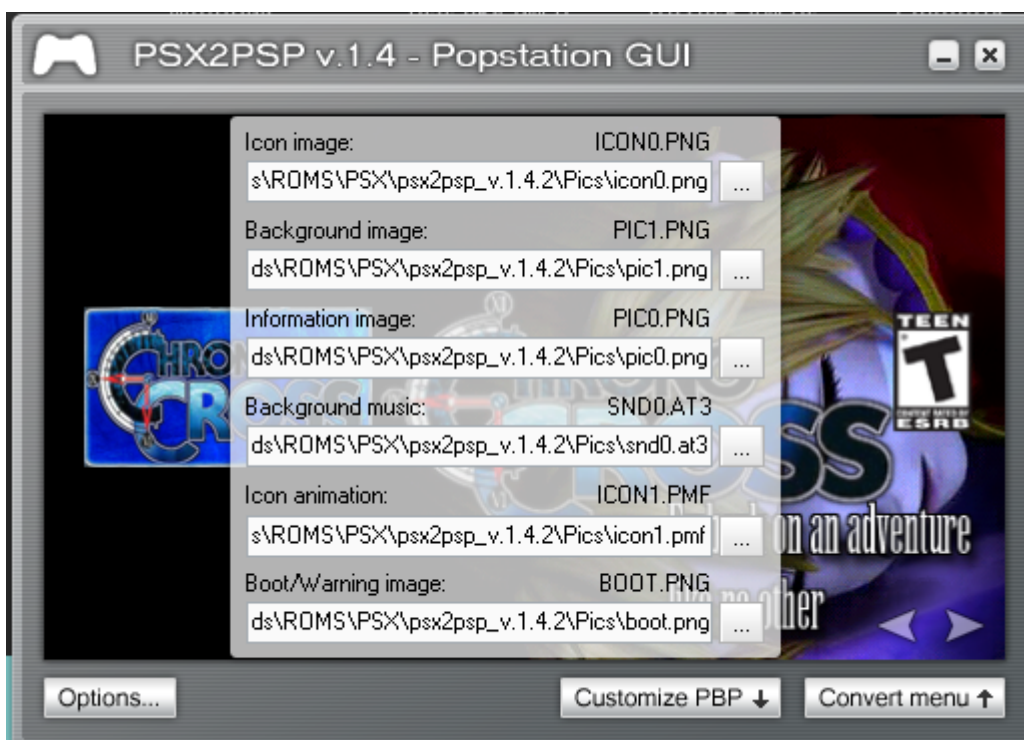
Select one or multiple ISO files to convert



Select the Output destination of the EBOOT.PBP file

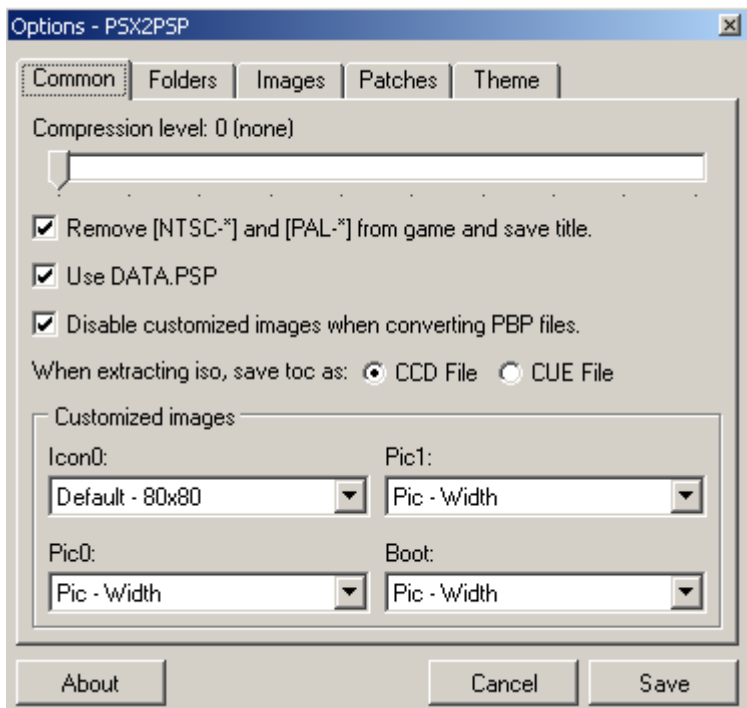


Choose an ICON0.png and a BACKGROUND.png images (at least)

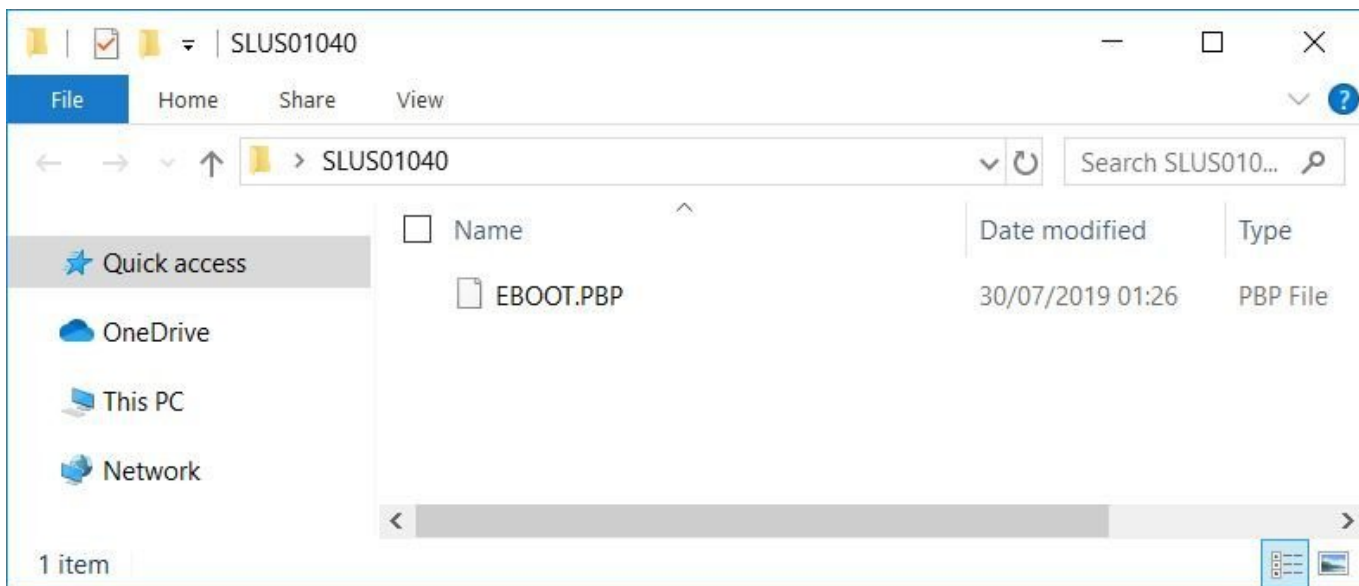


Select Convert

By Default, the PSX2PSP is set to 0 compress, but you can change it to max compression 9 at Options.



A folder with the GAMEID and the EBOOT.PBP file will be generated.



Rename the EBOOT.PBP to the game's name for better scrapper.

To convert the .PBP back to .CUE+.BIN do the same process, but instead select .PBP as the input

With PSXPackager

- **Windows/Mac/Linux:** <https://github.com/RupertAvery/PSXPackager/releases/>

PSXPackager is a command-line executable (Windows/Linux/OSX) and a Windows-only GUI available.

It enables you to convert your PlayStation backup disc images (.ISO, .IMG and .CUE+.BIN), also multi-discs (with .M3U), to a single PBP file format.

The GUI allows you to select and process several images in a queue (Batch mode).

It needs .NET 7:

```
sudo apt install dotnet7
```

Run the command line: `psxpackager -l <compress level from 0 to 9> -i <GAME.cue> -o <GAME.pbp>`

```
psxpackager -l 9 -i GAME.cue -o GAME.pbp
```

Convert back to .BIN+.CUE:

```
psxpackager -i GAME.pbp -o /output_path/
```

For multi-discs, create a .m3u with the content referring to the multi-discs:

GAME.m3u

```
GAME - Disc 1.cue  
GAME - Disc 2.cue  
GAME - Disc 3.cue
```

Run PSXPackager calling the .m3u file

```
psxpackager -l 9 -i GAME.m3u -o GAME.pbp
```

A folder with the GAME and the GAME.PBP file will be generated.

PSXPackager batch converting

Batch converting can be done with a simple for loop.

Linux/MacOS:

```
for i in *.iso; do -l 9 psxpackager -i "${i}" -o "${i}.pbp; done
```

Windows:

```
for %i in (*.iso) do psxpackager.exe -l 9 -i "%i" -o "%i".pbp
```

OR

Convert all supported files from SupportedFiles to .PBP

```
psxpackager -i "C:\SupportedFiles\*.*"  
psxpackager -i "/SupportedFiles/*.*"
```

Convert all PBP files to .BIN+.CUE

```
psxpackager -i "C:\PBPFfiles\*.PBP"
```

```
psxpackager -i "/PBPFfiles/*.PBP"
```

Convert all BIN matching 'GAME - Disc *.BIN' files to .PBP

```
psxpackager -i "C:\BinFiles\GAME - Disc ?.bin"  
psxpackager -i "/BinFiles/GAME - Disc ?.bin"
```

RVZ

The Dolphin team developed a new compression format based on WIA called [RVZ](#). Unlike all the previous formats, RVZ is lossless and can preserve the padding data on Wii discs as well as the necessary files needed by the Wii's IOS. Usage is very similar to GCZ in Dolphin itself, but it only works on newer Dolphin versions.

Supported systems

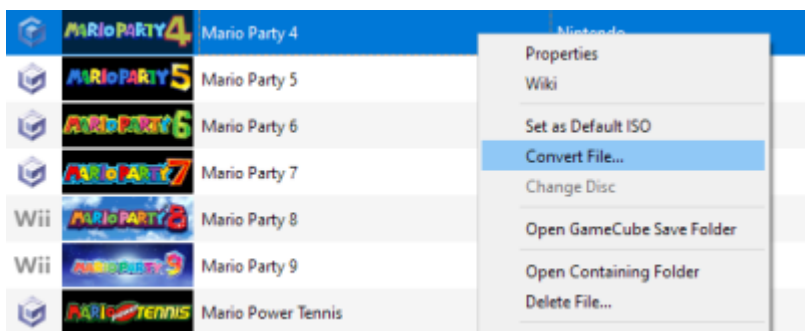
RVZ is only supported by the Dolphin emulator and therefore the recommended format for the following systems:

- [gamecube](#)
- [wii](#)

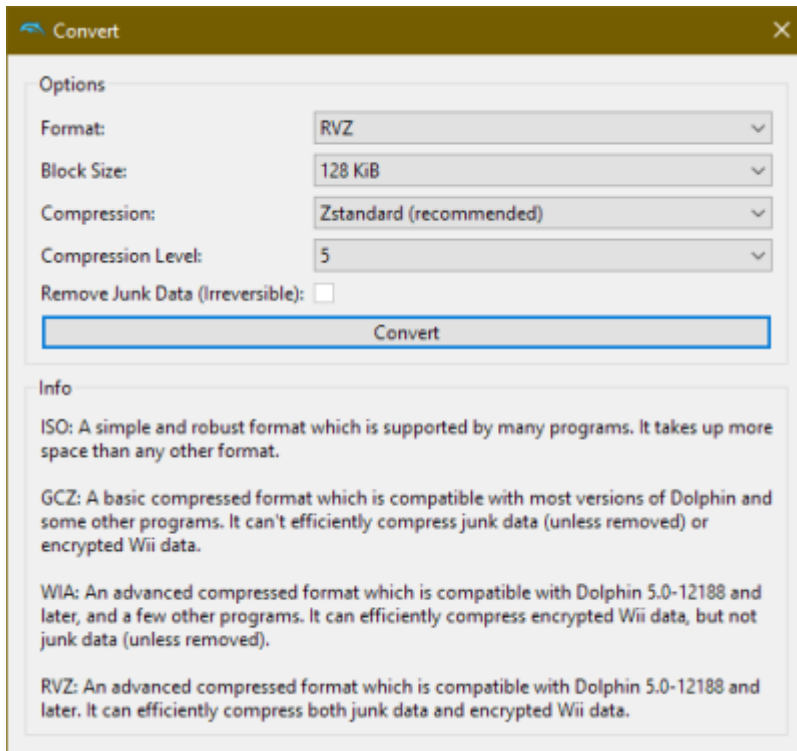
Creating RVZs

You need the [Dolphin](#) emulator (minimum version 5.0-12188+) to compress ISO files. At the moment the compression has to be done via `dolphin-config` in the **Applications** folder of the [F1] file manager.

Find the game in Dolphin's game list, right click and select **Convert File...**



The default settings should be fine, however for a better compression use those settings: RVZ, 2MiB, LZMA, level 9



This process is completely reversible.

RVZ batch converting

Just multi-select with pressing the *CTRL* key to choose multiple games, right-click and select **Convert File...**

SquashFS

SquashFS allows you to losslessly compress entire folders and all their contained items. This image can be extracted to be identical to the files that were compressed. Unlike ZIP/7Z/GZ files, SquashFS allows Batocera to present the contents of the compressed image to the system *as if though it weren't compressed at all* by automatically mounting them upon launch. This has been a latent feature but full integration with the tools necessary to handle SquashFS images was introduced in Batocera **v33**.

There are some limitations to keep in mind:

- SquashFS is **read-only**. Obviously, this causes issues with games that attempt to write to the directory it has been installed to, which is typical for many PC games to do. Some are exceptions, such as basic DOS titles. [For Windows, this can be worked around.](#) (



is this only for Windows?)

- Only systems that specify in their `_info.txt` as supporting squashfs will be able to launch SquashFS images.

SquashFS is particularly good for **PS3** and **Wii U** games, which are stored as folders which are not written to by the system.

Technical details

First, to be listed in EmulationStation, SquashFS images must be added technically by a developer to the list of eligible system. (aka, dos and ps3 are added for the moment, but it is very easy to add any system while it supports folder as rom). Squashfs images are mounted under `/var/run/squashfs/<rom>` and this is this directory that is given to the emulator.

Supported systems

System short name	SquashFS Status	v34 stable	v35 beta	Issue	More info
ports	Working	✗	✓	-	Need to create run.sh
scummvm	Working	✓	✓	-	Some games will only works if they are pre-configured on ScummVM
wiiu	Working	✓	✓	https://github.com/batocera-linux/batocera.linux/issues/6114	File <code><game>/code/<game>.rpx</code> can't be located at <code>/var/run/squashfs/<game></code> - FIXED on V34.
windows	Working	✓	✗	https://github.com/batocera-linux/batocera.linux/issues/6120	Only works for .wine games: .wtgz performance is very slow compared to .wsquashfs
ps3	Working	✓	✓	-	-
dos	Working	✓	✓	-	-
daphne	Working	✓	✓	-	-
xbox	Working	✓	✓	https://github.com/batocera-linux/batocera.linux/issues/5802	File can't load due to <code>/var/run/squashfs/<game></code> not be a regular file
easyrpg	Working	✓	✓	-	-
mugen	Not tested yet	-	-	https://github.com/batocera-linux/batocera.linux/issues/6120	Wine issues
ecwolf	Working	✓	✓	-	-

Creating a SquashFS file

This is currently only possible via SSH. Batocera utilizes `mksquashfs` to create SquashFS images. Syntax: `mksquashfs <game> <game>.squashfs`.

For example:

```
cd /userdata/roms/dos
mksquashfs skweek.pc skweek.pc.squashfs
```

Or to compress a single file :

```
cd /userdata/roms/xbox
mksquashfs crazytaxi3.iso crazytaxi3.iso.squashfs
```

Or to compress a single file with the xz compression option:

```
mksquashfs crazytaxi3.iso crazytaxi3.iso.squashfs -comp xz
```

Or to compress multiple files :

```
for i in *; do if [ -d "$i" ]; then mksquashfs "$i" "$i.squashfs"; fi; done
or
find . -maxdepth 1 -name "[^.]*" -type d -exec mksquashfs {} {}.squashfs \;
```

Or to compress multiple files with the xz compression option:

```
for i in *; do if [ -d "$i" ]; then mksquashfs "$i" "$i.squashfs" -comp xz;
fi; done
or
find . -maxdepth 1 -name "[^.]*" -type d -exec mksquashfs {} {}.squashfs -
comp xz \;
```

Or compress multiple .iso files to .squashfs:

```
for i in *.iso; do mksquashfs "${i}" "${i}.squashfs"; done
for i in *.iso; do mksquashfs "${i}" "${i}.squashfs" -comp xz; done
```

After confirming that the game still launches and runs correctly, the old folder can be safely removed.

If you use the btrfs filesystem, you can enable compression, and you'll get the same compression result without any action.

Uncompress a SquashFS file

Connect via samba and decompress files using a compatible decompress tool (use the smart uncompress to create a new folder): 7-zip, Picodrive

It can also be uncompressed using the unsquashfs command. Syntax: `unsquashfs -f -d <destination> <folder/game>.squashfs`

For example:

```
unsquashfs -f -d /userdata/roms/<system>/<gamedirectory>
/userdata/roms/<system>/<game>.squashfs
```

A successful decompression would look something like this:

```
batocera$ cd /userdata/roms/wiiu/
batocera$ unsquashfs -f -d ExtractionFolder SuperMario.squashfs
Parallel unsquashfs: Using 4 processors
23 inodes (2649 blocks) to write

[=====\] 2672/2672
100%

created 23 files
created 4 directories
```

```
created 0 symlinks
created 0 devices
created 0 fifos
created 0 sockets
created 0 hardlinks
```

For multiple unsquashfs uncompress command:

```
for i in *.squashfs; do unsquashfs -f -d ./"${i%.*}" ./"$i"; done
```

Manually mount a squashfs

It is possible to manually mount a squashFS. This could be used to simply access the data and copy it to somewhere else.

```
mount -t squashfs path/to/file.squashfs /mnt
```

WUA

WUA is a format used by the Wii U emulator Cemu. It is a single compressed file that contains the base game, its updates and installed DLC content.

Converting to WUA must be done via Cemu's interface. In Batocera, this can be found in the [F1] file manager in **Applications**.

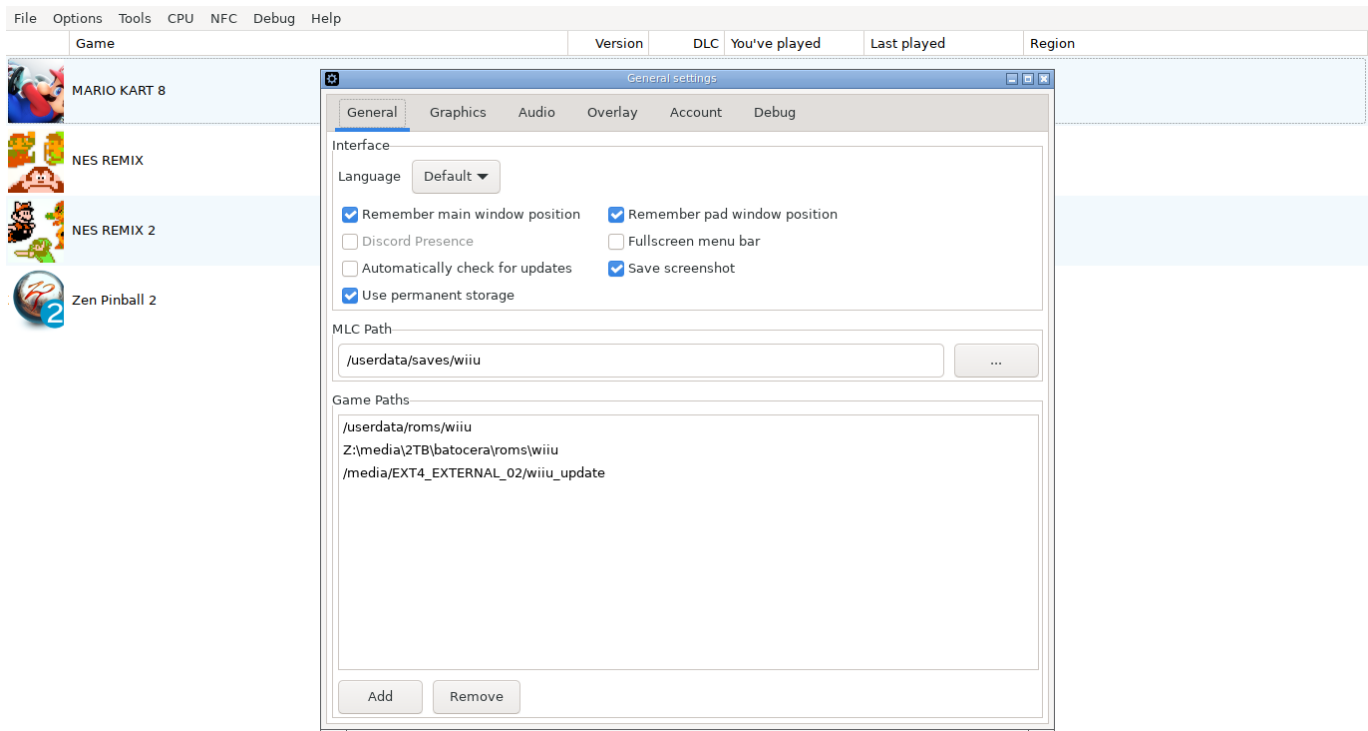
Setup

This is automatically done if Cemu has been launched at least once from ES. However if this is the first time Cemu has been opened, ensure that the paths are pointing to the correct locations:

- **MLC Path:** /userdata/saves/wiiu
- **Game Paths:** /userdata/roms/wiiu



This screencap does not reflect that. Are multiple paths actually required?



Cemu cannot detect squashFS files. Either mount them first and add them, or decompress them.

Cemu will automatically include any updates and DLCs that are installed when creating the WUA file. **Ensure they are installed first** before doing this.

Compress to WUA

Now, go to title manager, to convert them to .wua:



Navigate to **Tools** → **Title Manager** → (wtf is this?) Left button in the BASE game item with folder format → **Convert to Compressed Wii U archive (.wua)**, then set the destination folder as /userdata/roms/wiiu.

Title Manager Download Manager

Filter

Title ID	Name	Type	Version	Region	Format
0005000e-10175b00	Sonic Boom: - Rise of Lyric	update	16	USA	Folder
0005000c-10128f00	SONIC LOST WORLD	DLC	32	USA	Folder
0005000e-10176900	Splatoon	update	272	USA	Folder
0005000e-101bec00	Star Fox Guard	update	16	USA	Folder
0005000e-101b0400	Star Fox Zero	update	16	USA	Folder
0005000c-10135200	Star Wars Pinball	DLC	32	USA	Folder
0005000e-10135200	Star Wars Pinball	update	48	USA	Folder
0005000e-1018dc00	Super Mario Maker	update	272	USA	Folder
0005000e-1018dc00	Super Mario Maker	update	272	USA	Folder
0005000c-10144f00	Super Smash Bros. - for Wii U	DLC	96	USA	Folder
0005000c-10144f00	Super Smash Bros. - for Wii U	DLC	96	USA	Folder
0005000e-10144f00	Super Smash Bros. - for Wii U	update	288	USA	Folder
0005000e-10144f00	Super Smash Bros. - for Wii U	update	304	USA	Folder
0005000e-10110000	TEKKEN TAG TOURNAMENT 2 - Wii U EDITION	update	32	USA	Folder
0005000c-101c9400	The Legend of Zelda - Breath of the Wild	DLC	80	USA	Folder
0005000e-101c9400	The Legend of Zelda - Breath of the Wild	update	208	USA	Folder
0005000e-1019e500	THE LEGEND OF ZELDA - Twilight Princess HD	update	81	USA	Folder
0005000e-1014de00	The LEGO® Movie - Videogame	update	16	USA	Folder
0005000e-1012dc00	The Wonderful 101	update	16	USA	Folder
0005000e-10128a00	Trine 2 - Director's Cut	update	16	USA	Folder
0005000e-10184d00	Yoshi's Woolly World	update	32	USA	Folder
00050000-10115f00	Zen Pinball 2	base	0	USA	Folder
0005000c-10115f00	Zen Pinball 2	DLC	80	USA	Folder
0005000e-10115f00	Zen Pinball 2	update	96	USA	Folder

Install title

- Launch title
- Open directory
- Verify integrity of game files
- Convert to compressed Wii U archive (.wua)
- Delete

Here is the last chance to ensure it's detecting the update and DLC files. The base game, update and DLC must be the same region to be detected.

Title Manager Download Manager

Filter

Title ID	Name	Type	Version	Region	Format
00050000-1010ec00	MARIO KART 8	base	1	USA	Folder
00050000-10115f00	Zen Pinball 2	base	0	USA	Folder
00050000-10146000	NES REMIX	base	0	USA	Folder
00050000-10162500	NES REMIX 2	base	1	USA	Folder
0005000c-10101d00	New SUPER MARIO BROS. U	DLC	16	USA	Folder
0005000c-10101d00	New SUPER MARIO BROS. U	DLC	16	USA	Folder
0005000c-1010af00	Marvel Avengers™: - Battle for Earth	DLC	0	USA	Folder
0005000c-1010ed00	MARIO KART 8				
0005000c-10111700	Injustice: Gods Among Us				
0005000c-10115f00	Zen Pinball 2				
0005000c-10128f00	SONIC LOST WORLD				
0005000c-1012bd00	PIKMIN 3				
0005000c-1012cf00	RESIDENT EVIL REVELATIONS				
0005000c-10135200	Star Wars Pinball				
0005000c-10137c00	Batman™: - Arkham Origins				
0005000c-10138500	Pinball Arcade				
0005000c-10144000	Adventure Time: Explore the - Dungeon				
0005000c-10144f00	Super Smash Bros. - for Wii U	DLC	96	USA	Folder
0005000c-10144f00	Super Smash Bros. - for Wii U	DLC	96	USA	Folder
0005000c-10175b00	Sonic Boom: - Rise of Lyric	DLC	0	USA	Folder
0005000c-1017d800	Hyrule Warriors	DLC	208	USA	Folder
0005000c-101a6500	Kung Fu Panda - Showdown of Legendary Legends	DLC	0	USA	Folder
0005000c-101ac700	Adventure Time - Finn and Jake Investigations	DLC	0	USA	Folder
0005000c-101bef00	LEGO® MARVEL's Avengers	DLC	96	USA	Folder

Install title

Confirmation

The following content will be converted to a compressed Wii U archive file (.wua):

Base game: /userdata/roms/wiiu/Zen Pinball 2 [WBAEY4]
 Update: /media/EXT4_EXTERNAL_02/wiiu_update/Zen Pinball 2 (UPDATE DATA) (v96) (55.378 MB) (USA) (unpacked)
 DLC: /media/EXT4_EXTERNAL_02/wiiu_update/Zen Pinball 2 (DLC) (2.288 GB) (USA) (unpacked)

Cancel OK

Found 4 games, 58 updates, 25 DLCs and 0 save entries

Hit OK.

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