



GPL-3 Deltas Assessment

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Apertis the distribution is derived from Debian, from which it takes its philosophy, tools, workflows and packages. This robust, friendly and mature distribution provides a solid base on which to build an offering to suite the needs of very demanding markets such as the automotive industry.	
One big difference between Apertis and Debian is that <a href="#">Apertis avoids certain licenses</a> <sup>1</sup> , in order to allow its target market to avoid legal issues. Several licenses are considered unsuitable in parts of Apertis, GPL-3 being the most important one. As a consequence of this, Apertis adopts a number of strategies to ensure packages meant to be installed on target devices comply with these license restrictions.	
Several documents already cover specific cases or scenarios, which present the biggest licensing challenges:	
<ul style="list-style-type: none"><li>• <a href="#">GPL-3-free replacements of coreutils</a><sup>2</sup></li><li>• <a href="#">License-compliant TLS stack for Apertis targets</a><sup>3</sup></li></ul>	

<sup>1</sup><https://www.apertis.org/policies/license-expectations/>

<sup>2</sup><https://www.apertis.org/concepts/distribution/coreutils-replacement/>

<sup>3</sup><https://www.apertis.org/concepts/distribution/tls-stack/>

- [GPL-3-free replacements of GnuPG](#)<sup>4</sup>

Besides the topics covered by the above documents, Apertis implements different strategies to avoid such problems. In the cases where package license changed from GPL-2 to GPL-3, Apertis continues shipping the last license friendly version of the package, appending the suffix `-gplv2` if it is needed to differentiate from the latest version.

For releases older than v2023dev1:

- `findutils-gplv2`
- `readline5`

For releases older than v2023dev0, also:

- `cpio-gplv2`
- `diffutils-gplv2`
- `grep-gplv2`
- `gzip-gplv2`
- `sed-gplv2`
- `tar-gplv2`

In other cases, where the license issues was not in the package itself, but in one of its dependencies, Apertis tries to avoid the problem by either using a different equivalent dependency or using the last suitably licensed version of it. In those cases where the functionality provided by the dependency is not really required, Apertis opts for removing or disabling such functionality and in that way dropping the dependency.

## Impact

As discussed in the introduction, depending on the situation the impact of a delta is different. Based on the type of delta we can enumerate the following scenarios:

- Delta causes outdated package to be shipped
- Delta causes alternative package dependency to be used when compared to Debian
- Delta causes functionality to be disabled

Additionally the following aspects should be taken into account:

- Possibility of delta increment across time
- Number of packages in the dependency change

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<sup>4</sup><https://www.apertis.org/concepts/distribution/gnupg-replacement/>

## 69 Delta causes outdated package to be shipped

70 Since Apertis derives from Debian, generally it ships the same version, but as  
71 mentioned, in some cases it keeps shipping a specific version of a package for  
72 the `target` component, while keeping the latest in the `development` suite.

73 In general the impact of this kind of delta is high, since Apertis carries an old  
74 version of a package without updates and security bugfixes. For this reason  
75 deltas under this category should be examined closely, specially taking into  
76 account the aspects previously mentioned.

77 Below is a list of packages that are frozen at a specific version previous to the  
78 license change and the packages that depend on them in the `target` component.

79 For releases older than `v2023dev1`:

- 80 • `findutils-gplv2` (version 4.2.31)
- 81 • `readline5` (version 5.2)
  - 82 – `bluez`
  - 83 – `connman`
  - 84 – `lua5.2`
  - 85 – `lua5.3`
  - 86 – `mozjs78`
  - 87 – `python3.9`
- 88 • `libidn` (version 0.6.14)

89 Additionally for releases older than `v2023dev0`:

- 90 • `cpio-gplv2` (version 2.8)
  - 91 – `initramfs-tools-core`
- 92 • `diffutils-gplv2` (version 2.8.1)
- 93 • `grep-gplv2` (version 2.5.1a)
- 94 • `gzip-gplv2` (version 1.3.12)
- 95 • `sed-gplv2` (version 4.1.2)
- 96 • `tar-gplv2` (version 1.17)
  - 97 – `dpkg`

98 From the list above it clear that `readline5` `cpio-gplv2` and `tar-gplv2` are the  
99 package with higher impact in the system as they are used by other packages.

## 100 Delta causes alternative package dependency to be used

101 When it is possible to find an alternative to a package without license issues  
102 which provides similar functionality and it is present in Debian, the approach  
103 used is to switch to it, causing a delta. However, since the functionality is kept,  
104 the impact of the delta is considered lower than previous cases.

## 105 Delta causes functionality to be disabled

106 Under some circumstances, Apertis chooses to disable functionality to avoid a  
107 license issue. This approach is only valid if the functionality is not important,  
108 which requires an evaluation. Once it has been decided that the functionality is  
109 not a strong requirement a delta is introduced to disable it and drop dependen-  
110 cies which use unfriendly licenses. This generally only introduces a minor delta  
111 with respect to the package in Debian and is easy to maintain and port forward  
112 with updates in Debian.

## 113 Package summary for release v2023dev0 onwards

114 The table below shows the packages which have a license related delta with  
115 respect to Debian Bullseye. They are split into the following categories based  
116 on the scenarios described above:

- 117 • DF0: Disable functionality
- 118 • DF1: Disable minor functionality
- 119 • OP: Outdated package
- 120 • AP0: Use alternative outdated package
- 121 • AP1: Use alternative package

Package	Category	Information
base-files	DF0	Remove license information for GPL-3 LGPL-3 and MPL-1.1
bind9	DF0	Disable libidn2
bluez	AP1	Use of libedit instead of readline
connman	AP1	Use of libedit instead of readline
cpio	AP1	Use of libarchive-cpio as replacement
curl	DF0	Disable libidn2 librtmp
cyrus-sasl2	DF0	Disable saslfinger libdes and krb4
diffutils	AP1	Use of busybox-diffutils as replacement
flatpak	DF0	Disable gpg
glib-networking	AP1	Use openssl instead of gnutls
glibc	AP1	Avoid bashisms
gpgme1.0	AP0	Use of gunpg, drop libassuan
grep	AP1	Use of busybox-grep as replacement
gststreamer1.0	DF1	Disable libdw
gtk+3.0	DF1	Disable cups
gvfs	DF0	Disable trashlib
gzip	AP1	Use of busybox-gzip as replacement
initramfs-tools	AP0	Use of rust-coreutils
libblockdev	DF0	Disable parted
libcanberra	DF0	Disable tdb
libidn	OP	Outdated GPL-3 free version, pending evaluation about dual licensing and/or
liboauth	AP1	Use curl openssl instead of curl gnutls

Package	Category	Information
hunspell	AP1	Use of libedit instead of readline
mesa	DF0	Disable libefl
mktemp	XXX	Empty package, implemented in coreutils
openjpeg2	AP1	Use curl openssl instead of curl gnutls
openldap	AP1	Use curl openssl instead of curl gnutls
ostree	DF0	Disable libgpgme
pam	DF0	Replace pam-auth-update, disable NIS
pipewire	DF0, AP1	Disable libsdl2, use libedit instead of readline
pulseaudio	DF0	Disable libtdb
sed	AP1	Use of busybox-sed as replacement
systemd	DF0	Disable libdw, gnutls, libmicrohttpd
tar	AP1	Use of libarchive-tar as replacement
totem-pl-parser	DF1	Disable libquvi
tumbler	DF0	Use curl openssl instead of curl gnutls
udisks2	DF0	Disable parted
util-linux	DF1	Disable parse_date
v4l-utils	DF1	Disable gettext
webkit2gtk	DF1	Disable libencham-2
wpa	AP1	Use internal line edit instead of readline

## Required Action

We believe that the following actions are required to reduce the impact of these deltas. We have proposed different strategies depending on the impact of the delta, focusing on those which cause outdated packages to be shipped.

Other types of delta in general lead to reduced functionality which should be addressed only if it is required by a specific use case.

For the remaining cases, the impact is only related to drop functionality, which have little value for Apertis, in consequence we believe that the best approach is to keep the delta.

The strategies relies in find the best possible alternative, taking into account

- License: The replacement should meet [Apertis license expectations](https://www.apertis.org/policies/license-expectations/)<sup>5</sup> in order to be consider as a valid one
- Debian support: The Debian support guarantees a community support on the package and a easy adoption in Apertis
- Compatibility: The replacement should provide the functionality required by Apertis on target images. Since the focus is on embedded devices, this is usually a small subset of the functionality provided by a fully featured tool, designed to be used by a user from a command line. For example,

<sup>5</sup><https://www.apertis.org/policies/license-expectations/>

several alternative command line tools may use different arguments to provide functionality, for which existing users can be trivially altered or lack certain options, but in many cases these options will have little or no value when used in Apertis.

## Delta causes outdated package to be shipped in releases older than v2023dev1

This type of delta is the most problematic and requires immediate action as these packages are currently not receiving security updates and thus present a security risk.

### Package findutils-gplv2

**Source:** <https://www.gnu.org/software/findutils/>

Package `findutils-gplv2` ships version 4.2.31 of GNU `findutils` a set of basic directory searching utilities. Alternatives to this package are:

- [busybox find/xargs](#)<sup>6</sup>: BusyBox combines tiny versions of many common UNIX utilities into a single small executable, `find` and `xargs` among them.
  - License: GPLv2
  - Debian: Present
  - Apertis: Present
  - GNU compatibility: Low, only minimum set of feature
- [utils-findutils](#)<sup>7</sup>: A rust implementation of `findutils`
  - License: MIT License
  - Debian: Not present
  - Apertis: Not present
  - GNU compatibility: High in mind, however it is in early stage of development

### Conclusion

The package `utils-findutils` is being developed by the same community which develops `util-coreutils`, which has been chosen by Apertis as a replacement for `coreutils` as discussed in [GPL-3-free replacements of coreutils](#)<sup>8</sup>.

- High GNU compatibility
- High community support
- High community impact
- Portability in mind
- Ongoing development
- Implemented in a modern memory safe language

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<sup>6</sup><https://busybox.net/>

<sup>7</sup><https://github.com/utils/findutils>

<sup>8</sup><https://www.apertis.org/concepts/distribution/coreutils-replacement/>

175 Initial tests showed that additional functionality was required by some core  
176 packages (such as `initramfs-tools`), but recent changes have fixed these issues,  
177 making it a suitable replacement for `findutils-gplv2` in target images despite  
178 remaining limitations (e.g. `xargs` functionality is still basic).

## 179 Package `readline5`

180 **Source:** <https://tiswww.case.edu/php/chet/readline/rltop.html>

181 The `readline5` package ships version 5.2 of GNU `readline`. It provides a set of  
182 functions for use by applications that allow users to edit command lines as they  
183 are typed in. This same functionality can be provided by:

- 184 • [libedit](#)<sup>9</sup>: This is an autotool- and libtoolized port of the NetBSD Editline  
185 library (`libedit`). This Berkeley-style licensed command line editor library  
186 provides generic line editing, history, and tokenization functions, similar  
187 to those found in GNU Readline.
  - 188 – License: BSD-3-Clause
  - 189 – Debian: Present
  - 190 – Apertis: Present (target)
- 191 • [replxx](#)<sup>10</sup>: A small, portable GNU readline replacement for Linux, Windows  
192 and MacOS which is capable of handling UTF-8 characters. Unlike GNU  
193 readline, which is GPL, this library uses a BSD license and can be used  
194 in any kind of program.
  - 195 – License: BSD-3-Clause
  - 196 – Debian: Not present
  - 197 – Apertis: Not present

## 198 Conclusion

199 Since `libedit` is a mature package, based on NetBSD Editline library and is  
200 already present in Apertis, it is the primary candidate as a replacement. The  
201 approach in this case is to add support for it as alternative for `readline` in the  
202 packages which depend on it (`bluez` and `connman`).

## 203 Delta causes outdated package to be shipped in releases 204 older than `v2023dev0`

205 This type of delta is the most problematic and requires immediate action as these  
206 packages are currently not receiving security updates and thus present a security  
207 risk. These issues were addressed in `v2023dev0` with the stragy described below  
208 but they are still present in older releases.

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<sup>9</sup><https://www.thrysoee.dk/editline/>

<sup>10</sup><https://github.com/AmokHuginnsson/replxx>



## 209 Package tar-gplv2

210 Source: <https://www.gnu.org/software/tar/>

211 Package tar-gplv2 ships version 1.17 of GNU tar which provides the ability to  
212 create and manipulate tar archives. There are the following alternatives with  
213 the same functionality:

- 214 • [libarchive](https://www.libarchive.org/)<sup>11</sup>: Multi-format archive and compression library, which includes  
215 the libarchive library, the bsdtar and bsdcpio command-line programs, full  
216 test suite, and documentation.
  - 217 – License: BSD-2-clause
  - 218 – Debian: Present
  - 219 – Apertis: Present (target)
  - 220 – GNU compatibility: Medium, basic set of features
- 221 • [busybox tar](https://busybox.net/)<sup>12</sup>: BusyBox combines tiny versions of many common UNIX  
222 utilities into a single small executable, tar among them.
  - 223 – License: GPLv2
  - 224 – Debian: Present
  - 225 – Apertis: Present
  - 226 – GNU compatibility: Low, only minimum set of features
- 227 • [tar-rs](https://github.com/alexcrichon/tar-rs)<sup>13</sup>: Rust library to manage TAR archives.
  - 228 – License: Apache
  - 229 – Debian: Not present
  - 230 – Apertis: Not present

## 231 Conclusion

232 The package libarchive is mature and already in Apertis. It provides bsdtar  
233 which gives a good basement to build a replacement for tar. The approach in  
234 this case is to test the use case of interest for target images, to install packages  
235 with dpkg.

236 Initial tests replacing tar with bsdtar or busybox tar and installing a package

```
237 $ sudo apt reinstall libc6
238 Reading package lists... Done
239 Building dependency tree... Done
240 Reading state information... Done
241 The following packages were automatically installed and are no longer required:
242  libcolord2 libegl1-mesa libsys-cpuaffinity-perl libxdelta2 pbzip2 pixz xdelta xdelta3
243 Use 'sudo apt autoremove' to remove them.
244 0 upgraded, 0 newly installed, 1 reinstalled, 0 to remove and 0 not upgraded.
```

---

<sup>11</sup><https://www.libarchive.org/>

<sup>12</sup><https://busybox.net/>

<sup>13</sup><https://github.com/alexcrichon/tar-rs>

```

245 Need to get 2,831 kB of archives.
246 After this operation, 0 B of additional disk space will be used.
247 Get:1 https://repositories.apertis.org/apertis v2022dev2/target amd64 libc6 amd64 2.31-
248 9apertis2bv2022dev2b1 [2,831 kB]
249 Fetched 2,831 kB in 3s (887 kB/s)
250 debconf: unable to initialize frontend: Dialog
251 debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share
252 debconf: falling back to frontend: Readline
253 Preconfiguring packages ...
254 -x -f - --warning=no-timestamp
255 -x -f -
256 bsdtar: Option --warning=no-timestamp is not supported
257 Usage:
258   List:      bsdtar -tf <archive-filename>
259   Extract:   bsdtar -xf <archive-filename>
260   Create:    bsdtar -cf <archive-filename> [filenames...]
261   Help:      bsdtar --help
262 dpkg-deb: error: tar subprocess returned error exit status 1
263 dpkg:  error  processing  archive  /var/cache/apt/archives/libc6_2.31-
264 9apertis2bv2022dev2b1_amd64.deb (--unpack):
265  dpkg-deb --control subprocess returned error exit status 2
266 Errors were encountered while processing:
267  /var/cache/apt/archives/libc6_2.31-9apertis2bv2022dev2b1_amd64.deb
268 E: Sub-process /usr/bin/dpkg returned an error code (1)
269 After omitting the argument the process finish without issues.
270 As a result, with little effort the either bsdtar or busybox tar can be used as a
271 valid replacement of tar.

```

## 272 Package cpio-gplv2

273 **Source:** <https://www.gnu.org/software/cpio/>

274 Package cpio-gplv2 ships version 2.8 of GNU cpio which is used to copies files  
 275 into or out of a cpio or tar archive. The archive can be another file on the disk,  
 276 a magnetic tape, or a pipe. This same functionality can be provided by:

- 277 • [libarchive](https://www.libarchive.org/)<sup>14</sup>: Multi-format archive and compression library, which includes  
 278 the libarchive library, the bsdtar and bsdcpio command-line programs, full  
 279 test suite, and documentation.
  - 280 – License: BSD-2-clause
  - 281 – Debian: Present
  - 282 – Aperts: Present
  - 283 – GNU compatibility: Medium, basic set of features

---

<sup>14</sup><https://www.libarchive.org/>

- 284 • [busybox cpio](#)<sup>15</sup>: BusyBox combines tiny versions of many common UNIX  
285 utilities into a single small executable, `cpio` among them.
- 286     – License: GPLv2
- 287     – Debian: Present
- 288     – Apertis: Present
- 289     – GNU compatibility: Low, only minimum set of feature
- 290 • [cpio-rs](#)<sup>16</sup>: Rust library to manage CPIO archives.
- 291     – License: MIT License
- 292     – Debian: Not present
- 293     – Apertis: Not present

## 294 Conclusion

295 The package `libarchive` is mature and already packaged in Apertis. This pro-  
296 vides `bsdcpio` as a good base to build a replacement for `cpio`. In this case we  
297 need to test if it can successfully be used to build the `initramfs` used in Apertis.  
298 Initial test, replacing `cpio` with `bsdcpio` and `busybox cpio` and running `update-`  
299 `initramfs`, was successful with no errors.

## 300 Package `diffutils-gplv2`

301 Source: <https://www.gnu.org/software/diffutils/>

302 Package `diffutils-gplv2` ships version 2.8.1 of GNU `diffutils`, a set of programs  
303 to find differences between files. Similar functionality can be obtained by:

- 304 • [busybox diff](#)<sup>17</sup>: BusyBox combines tiny versions of many common UNIX  
305 utilities into a single small executable, `diff` among them.
- 306     – License: GPLv2
- 307     – Debian: Present
- 308     – Apertis: Present
- 309     – GNU compatibility: Low, only minimum set of feature
- 310 • [ccdiffe](#)<sup>18</sup>: Perl script to achieve same functionality than `diff` but improving  
311 the visual output with colors.
- 312     – License: Artistic-2.0
- 313     – Debian: Present
- 314     – Apertis: Not present
- 315     – GNU compatibility: High
- 316     – Runtime dependencies:
- 317         \* `libalgorithm-diff-xs-perl` (not in Apertis - Artistic)

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<sup>15</sup><https://busybox.net/>

<sup>16</sup><https://github.com/jcreekmore/cpio-rs>

<sup>17</sup><https://busybox.net/>

<sup>18</sup><https://metacpan.org/pod/App::ccdiffe>

- 318           \* libalgorithm-diff-perl (development - Artistic)
- 319           \* libscalar-list-utils-perl (development - Artistic)
- 320       • [colordiff](#)<sup>19</sup>: The Perl script `colordiff` is a wrapper for `diff` and produces
- 321           the same output but with pretty ‘syntax’highlighting. Colour schemes can
- 322           be customized.
- 323       • [rust-diff](#)<sup>20</sup>: A rust library to compute text diffs.

## 324 Conclusion

325 The most suitable replacement found is `busybox diff`, since it provides the basic  
 326 functionality required on target images. Initial tests shows that `ccdiff` has  
 327 same functionality, very similar arguments and similar output (adds colors) to  
 328 `diff`. However, since it is a `perl` script it requires additional dependencies to be  
 329 installed.

330 Additionally it was found that `diff` is used on package install by `dpkg` but the  
 331 process runs smoothly with `busybox diff` and also with `ccdiff`. The features  
 332 of `cmp`, `diff3` and `sdiff` are not supported, however there is not much value in  
 333 target images.

## 334 Package grep-gplv2

335 **Source:** <https://www.gnu.org/software/grep/>

336 Package `grep-gplv2` ships version 2.5.1a of GNU `grep`, which searches one or more  
 337 input files for lines containing a match to a specified pattern. By default, `grep`  
 338 outputs the matching lines.

- 339       • [busybox grep](#)<sup>21</sup>: BusyBox combines tiny versions of many common UNIX
- 340           utilities into a single small executable, `grep` among them.
  - 341           – License: GPLv2
  - 342           – Debian: Present
  - 343           – Apertis: Present
  - 344           – GNU compatibility: Low, only minimum set of feature
- 345       • [ugrep](#)<sup>22</sup>: A `grep` alternative aim to be faster and with additional features.
  - 346           – License: BSD-3-Clause License
  - 347           – Debian: Present
  - 348           – Apertis: Not present
  - 349           – GNU compatibility: High
  - 350           – Runtime dependencies:
    - 351               \* `libbz2-1.0` (target)
    - 352               \* `libc6` (target)

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<sup>19</sup><https://www.colordiff.org/>

<sup>20</sup><https://docs.rs/diff/0.1.12/diff/>

<sup>21</sup><https://busybox.net/>

<sup>22</sup><https://github.com/Genivia/ugrep>

353           \* libgcc-s1 (target)  
354           \* liblz4-1 (target)  
355           \* liblzma5 (target)  
356           \* libpcre2-8-0 (target)  
357           \* libstdc++6 (target)  
358           \* libzstd1 (target)  
359           \* zlib1g (target)

## 360 Conclusion

361 The goal to provide the required features for target images can be accomplish  
362 by using `busybox grep` without adding additional packages, making it the best  
363 option. Initial tests booting an image and installing packages don't show any  
364 issues.

365 It is worth mentioning that in cases where higher compatibility with GNU is  
366 required, the `ugrep` package is already in Debian and all its dependencies are  
367 already in `target`, making it a viable alternative.

## 368 Package `gzip-gplv2`

369 **Source:** <https://www.gnu.org/software/gzip/>

- 370     • `busybox gzip`<sup>23</sup>: BusyBox combines tiny versions of many common UNIX  
371       utilities into a single small executable, `gzip` among them.
  - 372       – License: GPLv2
  - 373       – Debian: Present
  - 374       – Apertis: Present
  - 375       – GNU compatibility: Low, only minimum set of feature
- 376     • `flate2-rs`<sup>24</sup>: Rust library to manage ZIP archives.
  - 377       – License: Apache
  - 378       – Debian: Not present
  - 379       – Apertis: Not present

## 380 Conclusion

381 In order to replace `gzip` the best alternative is to used `busybox gzip`, which even  
382 with the its limitations it is enough for the requirements in target images

## 383 Package `sed-gplv2`

384 **Source:** <https://www.gnu.org/software/sed/>

385 Package `sed-gplv2` ships version 4.1.2 of GNU `sed` a non-interactive command-line  
386 text editor.

---

<sup>23</sup><https://busybox.net/>

<sup>24</sup><https://github.com/rust-lang/flate2-rs>

- 387 • `busybox sed`<sup>25</sup>: BusyBox combines tiny versions of many common UNIX  
388 utilities into a single small executable, `sed` among them.
  - 389 – License: GPLv2
  - 390 – Debian: Present
  - 391 – Apertis: Present
  - 392 – GNU compatibility: Medium, only minimum set of feature, but there  
393 are not much difference

## 394 Conclusion

395 In order to provide a replacement for `sed-gplv2` the use of `busybox sed` is recom-  
396 mended since no other package depends on and the basic functionality provided  
397 by `busybox sed` covers most common use cases.

## 398 Initial tests

399 Besides of the partial tests done when analyzing each package, as part of the  
400 initial test the following actions have been done

- 401 • Boot target image with tools replaced
- 402 • Reinstall all the packages in target image

403 These rest were passed successfully which shows that the suggested approach  
404 is viable. Despite this promising results further testing should be conducted to  
405 assure a smooth transition.

## 406 General conclusions

407 For most of the packages there is a valid replacement in Debian Bullseye which  
408 should require little effort. However there are two that will require a develop-  
409 ment effort

- 410 • `readline5`
- 411 • `findutils-gplv2`

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<sup>25</sup><https://busybox.net/>