



GPL-3 Deltas Assessment

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18 Apertis the distribution is derived from Debian, from which it takes its philos-  
19 ophy, tools, workflows and packages. This robust, friendly and mature distri-  
20 bution provides a solid base on which to build an offering to suite the needs of  
21 very demanding markets such as the automotive industry.

22 One big difference between Apertis and Debian is that [Apertis avoids certain](#)  
23 [licenses](#)<sup>1</sup>, in order to allow its target market to avoid legal issues. Several licenses  
24 are considered unsuitable in parts of Apertis, GPL-3 being the most important  
25 one. As a consequence of this, Apertis adopts a number of strategies to ensure  
26 packages meant to be installed on target devices comply with these license  
27 restrictions.

28 Several documents already cover specific cases or scenarios, which present the  
29 biggest licensing challenges:

- 30 • [GPL-3-free replacements of coreutils](#)<sup>2</sup>
- 31 • [License-compliant TLS stack for Apertis targets](#)<sup>3</sup>
- 32 • [GPL-3-free replacements of GnuPG](#)<sup>4</sup>

33 Besides the topics covered by the above documents, Apertis implements different  
34 strategies to avoid such problems. In the cases where package license changed  
35 from GPL-2 to GPL-3, Apertis continues shipping the last license friendly ver-

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<sup>1</sup><https://em.pages.apertis.org/apertis-website/policies/license-expectations/>  
<sup>2</sup><https://em.pages.apertis.org/apertis-website/concepts/coreutils-replacement/>  
<sup>3</sup><https://em.pages.apertis.org/apertis-website/concepts/tls-stack/>  
<sup>4</sup><https://em.pages.apertis.org/apertis-website/concepts/gnupg-replacement/>

36 sion of the package, appending the suffix `-gplv2` if it is needed to differentiate  
37 from the latest version

- 38 • `readline5`
- 39 • `cpio-gplv2`
- 40 • `diffutils-gplv2`
- 41 • `findutils-gplv2`
- 42 • `grep-gplv2`
- 43 • `gzip-gplv2`
- 44 • `sed-gplv2`
- 45 • `tar-gplv2`

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

## 52 **Impact**

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

- 56 • Delta causes outdated package to be shipped
- 57 • Delta causes alternative package dependency to be used when compared  
58 to Debian
- 59 • Delta causes functionality to be disabled

60 Additionally the following aspects should be taken into account:

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

### 63 **Delta causes outdated package to be shipped**

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

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

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

- 73 • readline5 (version 5.2)
- 74     – bluez
- 75     – connman
- 76 • cpio-gplv2 (version 2.8)
- 77     – initramfs-tools-core
- 78 • diffutils-gplv2 (version 2.8.1)
- 79 • findutils-gplv2 (version 4.2.31)
- 80 • grep-gplv2 (version 2.5.1a)
- 81 • gzip-gplv2 (version 1.3.12)
- 82 • sed-gplv2 (version 4.1.2)
- 83 • tar-gplv2 (version 1.17)
- 84     – dpkg

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

### 87 **Delta causes alternative package dependency to be used**

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

### 92 **Delta causes functionality to be disabled**

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

## 100 **Package summary**

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

- 104 • DF0: Disable functionality
- 105 • DF1: Disable minor functionality
- 106 • OP: Outdated package
- 107 • AP0: Use alternative outdated package
- 108 • 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	AP0	Use of libreadline-gplv2-dev
connman	AP0	Use of libreadline-gplv2-dev
coreutils-gplv2	OP	Outdated GPL-3 free version
cpio-gplv2	OP	Outdated GPL-3 free version
curl	DF0	Disable libidn2 librtmp
cyrus-sasl2	DF0	Disable saslfinger libdes and krb4
diffutils-gplv2	OP	Outdated GPL-3 free version
findutils-gplv2	OP	Outdated GPL-3 free version
flatpak	DF0	Disable gpg
glib-networking	AP1	Use openssl instead of gnutls
glibc	AP1	Avoid bashisms
gnupg2	XXX	Need to be moved to development
gpgme1.0	AP0	Use of gunpg, drop libassuan
grep-gplv2	OP	Outdated GPL-3 free version
gststreamer1.0	DF1	Disable libdw
gtk+3.0	DF1	Disable cups
gvfs	DF0	Disable trashlib
gzip-gplv2	OP	Outdated GPL-3 free version
initramfs-tools	AP0	Use coreutils-gplv2
libblockdev	DF0	Disable parted
libcanberra	DF0	Disable tdb
liboauth	AP1	Use curl openssl instead of curl gnutls
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	Disable libSDL2
pulseaudio	DF0	Disable libtdb
readline5	OP	Outdated GPL-3 free version
sed-gplv2	OP	Outdated GPL-3 free version
systemd	DF0	Disable libdw, gnutls, libmicrohttpd
tar-gplv2	OP	Outdated GPL-3 free version
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 libenchant-2
wpa	AP1	Use internal line edit instead of readline

## 109 Required Action

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

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

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

- 117 • License: The replacement should meet [Apertis license expectations](#)<sup>5</sup> in  
118 order to be consider as a valid one
- 119 • Debian support: The Debian support guarantees a community support on  
120 the package and a easy adoption in Apertis
- 121 • Compatibility: The replacement should provide the functionality required  
122 by Apertis on target images. Since the focus is on embedded devices, this  
123 is usually a small subset of the functionality provided by a fully featured  
124 tool, designed to be used by a user from a command line. For example,  
125 several alternative command line tools may use different arguments to  
126 provide functionality, for which existing users can be trivially altered or  
127 lack certain options, but in many cases these options will have little or no  
128 value when used in Apertis.

## 129 Delta causes outdated package to be shipped

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

### 133 Package readline5

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

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

- 138 • [libedit](#)<sup>6</sup>: This is an autotool- and libtoolized port of the NetBSD Editline  
139 library (`libedit`). This Berkeley-style licensed command line editor library  
140 provides generic line editing, history, and tokenization functions, similar  
141 to those found in GNU Readline.
  - 142 – License: BSD-3-Clause
  - 143 – Debian: Present
  - 144 – Apertis: Present (target)

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<sup>5</sup><https://em.pages.apertis.org/apertis-website/policies/license-expectations/>

<sup>6</sup><https://www.thrysoee.dk/editline/>

- 145 • [replxx](#)<sup>7</sup>: A small, portable GNU readline replacement for Linux, Windows  
146 and MacOS which is capable of handling UTF-8 characters. Unlike GNU  
147 readline, which is GPL, this library uses a BSD license and can be used  
148 in any kind of program.
  - 149 – License: BSD-3-Clause
  - 150 – Debian: Not present
  - 151 – Apertis: Not present

## 152 Conclusion

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

## 157 Package tar-gplv2

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

159 Package `tar-gplv2` ships version 1.17 of GNU `tar` which provides the ability to  
160 create and manipulate tar archives. There are the following alternatives with  
161 the same functionality:

- 162 • [libarchive](#)<sup>8</sup>: Multi-format archive and compression library, which includes  
163 the `libarchive` library, the `bsdtar` and `bsdcpio` command-line programs,  
164 full test suite, and documentation.
  - 165 – License: BSD-2-clause
  - 166 – Debian: Present
  - 167 – Apertis: Present (target)
  - 168 – GNU compatibility: Medium, basic set of features
- 169 • [busybox tar](#)<sup>9</sup>: BusyBox combines tiny versions of many common UNIX  
170 utilities into a single small executable, `tar` among them.
  - 171 – License: GPLv2
  - 172 – Debian: Present
  - 173 – Apertis: Present
  - 174 – GNU compatibility: Low, only minimum set of features
- 175 • [tar-rs](#)<sup>10</sup>: Rust library to manage TAR archives.
  - 176 – License: Apache
  - 177 – Debian: Not present
  - 178 – Apertis: Not present

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<sup>7</sup><https://github.com/AmokHuginnsson/replxx>

<sup>8</sup><https://www.libarchive.org/>

<sup>9</sup><https://busybox.net/>

<sup>10</sup><https://github.com/alexcrichon/tar-rs>

179 **Conclusion**

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

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

```
185 $ sudo apt reinstall libc6
186 Reading package lists... Done
187 Building dependency tree... Done
188 Reading state information... Done
189 The following packages were automatically installed and are no longer required:
190  libcolord2 libegl1-mesa libsys-cpuaffinity-perl libxdelta2 pbzip2 pixz xdelta xdelta3
191 Use 'sudo apt autoremove' to remove them.
192 0 upgraded, 0 newly installed, 1 reinstalled, 0 to remove and 0 not upgraded.
193 Need to get 2,831 kB of archives.
194 After this operation, 0 B of additional disk space will be used.
195 Get:1 https://repositories.apertis.org/apertis v2022dev2/target amd64 libc6 amd64 2.31-
196 9apertis2bv2022dev2b1 [2,831 kB]
197 Fetched 2,831 kB in 3s (887 kB/s)
198 debconf: unable to initialize frontend: Dialog
199 debconf: (No usable dialog-like program is installed, so the dialog based frontend cannot be used. at /usr/share
200 debconf: falling back to frontend: Readline
201 Preconfiguring packages ...
202 -x -f - --warning=no-timestamp
203 -x -f -
204 bsdtar: Option --warning=no-timestamp is not supported
205 Usage:
206   List:   bsdtar -tf <archive-filename>
207   Extract: bsdtar -xf <archive-filename>
208   Create: bsdtar -cf <archive-filename> [filenames...]
209   Help:   bsdtar --help
210 dpkg-deb: error: tar subprocess returned error exit status 1
211 dpkg: error processing archive /var/cache/apt/archives/libc6_2.31-
212 9apertis2bv2022dev2b1_amd64.deb (--unpack):
213  dpkg-deb --control subprocess returned error exit status 2
214 Errors were encountered while processing:
215  /var/cache/apt/archives/libc6_2.31-9apertis2bv2022dev2b1_amd64.deb
216 E: Sub-process /usr/bin/dpkg returned an error code (1)
```

217 After omitting the argument the process finish without issues.

218 **Package cpio-gplv2**

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



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

- 223 • [libarchive](https://www.libarchive.org/)<sup>11</sup>: Multi-format archive and compression library, which includes  
224 the `libarchive` library, the `bsdtar` and `bsdcpio` command-line programs, full  
225 test suite, and documentation.
  - 226 – License: BSD-2-clause
  - 227 – Debian: Present
  - 228 – Aperts: Present
  - 229 – GNU compatibility: Medium, basic set of features
- 230 • [busybox cpio](https://busybox.net/)<sup>12</sup>: BusyBox combines tiny versions of many common UNIX  
231 utilities into a single small executable, `cpio` among them.
  - 232 – License: GPLv2
  - 233 – Debian: Present
  - 234 – Apertis: Present
  - 235 – GNU compatibility: Low, only minimum set of feature
- 236 • [cpio-rs](https://github.com/jcreekmore/cpio-rs)<sup>13</sup>: Rust library to manage CPIO archives.
  - 237 – License: MIT License
  - 238 – Debian: Not present
  - 239 – Apertis: Not present

## 240 Conclusion

241 The package `libarchive` is mature and already packaged in Apertis. This pro-  
242 vides `bsdcpio` as a good base to build a replacement for `cpio`. In this case we  
243 need to test if it can successfully be used to build the `initramfs` used in Apertis.

244 Initial test, replacing `cpio` with `bsdcpio` and `busybox cpio` and running `update-`  
245 `initramfs`, was successful with no errors.

## 246 Package `diffutils-gplv2`

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

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

- 250 • [busybox diff](https://busybox.net/)<sup>14</sup>: BusyBox combines tiny versions of many common UNIX  
251 utilities into a single small executable, `diff` among them.
  - 252 – License: GPLv2
  - 253 – Debian: Present

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

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

<sup>13</sup><https://github.com/jcreekmore/cpio-rs>

<sup>14</sup><https://busybox.net/>

- 254           – Apertis: Present
- 255           – GNU compatibility: Low, only minimum set of feature
- 256       • [ccdiff](#)<sup>15</sup>: Perl script to achieve same functionality than `diff` but improving
- 257           the visual output with colors.
  - 258           – License: Artistic-2.0
  - 259           – Debian: Present
  - 260           – Apertis: Not present
  - 261           – GNU compatibility: High
  - 262           – Runtime dependencies:
    - 263           \* `libalgorithm-diff-xs-perl` (not in Apertis - Artistic)
    - 264           \* `libalgorithm-diff-perl` (development - Artistic)
    - 265           \* `libscalar-list-utils-perl` (development - Artistic)
- 266       • [colordiff](#)<sup>16</sup>: The Perl script `colordiff` is a wrapper for `diff` and produces
- 267           the same output but with pretty ‘syntax’ highlighting. Colour schemes
- 268           can be customized.
- 269       • [rust-diff](#)<sup>17</sup>: A rust library to compute text diffs.

## 270 Conclusion

271 The most suitable replacement found is `busybox diff`, since it provides the basic

272 functionality required on target images. Initial tests shows that `ccdiff` has

273 same functionality, very similar arguments and similar output (adds colors) to

274 `diff`. However, since it is a `perl` script it requires additional dependencies to be

275 installed.

276 Additionally it was found that `diff` is used on package install by `dpkg` but the

277 process runs smoothly with `busybox diff` and also with `ccdiff`. The features

278 of `cmp`, `diff3` and `sdiff` are not supported, however there is not much value in

279 target images.

## 280 Package `findutils-gplv2`

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

282 Package `findutils-gplv2` ships version 4.2.31 of GNU `findutils` a set of basic

283 directory searching utilities. Alternatives to this package are:

- 284       • [busybox find/xargs](#)<sup>18</sup>: BusyBox combines tiny versions of many common
- 285           UNIX utilities into a single small executable, `find` and `xargs` among them.
  - 286           – License: GPLv2
  - 287           – Debian: Present
  - 288           – Apertis: Present

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<sup>15</sup><https://metacpan.org/pod/App::ccdiff>

<sup>16</sup><https://www.colordiff.org/>

<sup>17</sup><https://docs.rs/diff/0.1.12/diff/>

<sup>18</sup><https://busybox.net/>

- 289           – GNU compatibility: Low, only minimum set of feature
- 290   • [utils-findutils<sup>19</sup>](#): A rust implementation of `findutils`
  - 291           – License: MIT License
  - 292           – Debian: Not present
  - 293           – Apertis: Not present
  - 294           – GNU compatibility: High in mind, however it is in early stage of
  - 295           development

## 296 **Conclusion**

297 Currently the best approach to have a replacement for the set of utilities provided by `findutils` is to use `busybox find` and `busybox xargs`. These are already present in Apertis and their limited functionality is not impacting the existing limited usage by the packages which depend on them.

301 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` based on its pros.

- 304   • High GNU compatibility
- 305   • High community support
- 306   • High community impact
- 307   • Portability in mind
- 308   • Ongoing development
- 309   • Implemented in a modern memory safe language

310 However, it is in an early stage of development and thus we recommend to wait for it to mature and then re-evaluate it as a replacement for `find`. Additionally it is important to mention that it does not yet support `xargs`.

313 Unfortunately initial tests with `busybox find` show that additional functionality is required by `update-initramfs`

```
315 find: unrecognized: -printf
```

```
316 find: unrecognized: -regextype
```

317 A similar issue is found with `utils-findutils find` which triggers

```
318 find: unrecognized: -printf
```

319 These limitations needs to be addressed before switching to it.

## 320 **Package `grep-gplv2`**

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

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

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324 <sup>19</sup><https://github.com/uutils/findutils>

- 325 • [busybox grep](#)<sup>20</sup>: BusyBox combines tiny versions of many common UNIX  
326 utilities into a single small executable, `grep` among them.
  - 327 – License: GPLv2
  - 328 – Debian: Present
  - 329 – Apertis: Present
  - 330 – GNU compatibility: Low, only minimum set of feature
- 331 • [ugrep](#)<sup>21</sup>: A `grep` alternative aim to be faster and with additional features.
  - 332 – License: BSD-3-Clause License
  - 333 – Debian: Present
  - 334 – Apertis: Not present
  - 335 – GNU compatibility: High
  - 336 – Runtime dependencies:
    - 337 \* `libbz2-1.0` (target)
    - 338 \* `libc6` (target)
    - 339 \* `libgcc-s1` (target)
    - 340 \* `liblz4-1` (target)
    - 341 \* `liblzma5` (target)
    - 342 \* `libpcre2-8-0` (target)
    - 343 \* `libstdc++6` (target)
    - 344 \* `libzstd1` (target)
    - 345 \* `zlib1g` (target)

## 346 Conclusion

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

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

## 354 Package `gzip-gplv2`

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

- 356 • [busybox gzip](#)<sup>22</sup>: BusyBox combines tiny versions of many common UNIX  
357 utilities into a single small executable, `gzip` among them.
  - 358 – License: GPLv2
  - 359 – Debian: Present
  - 360 – Apertis: Present
  - 361 – GNU compatibility: Low, only minimum set of feature

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<sup>20</sup><https://busybox.net/>

<sup>21</sup><https://github.com/Genivia/ugrep>

<sup>22</sup><https://busybox.net/>

- 362 • [flate2-rs](#)<sup>23</sup>: Rust library to manage ZIP archives.
- 363     – License: Apache
- 364     – Debian: Not present
- 365     – Apertis: Not present

## 366 Conclusion

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

## 369 Package `sed-gplv2`

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

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

- 373 • [busybox sed](#)<sup>24</sup>: BusyBox combines tiny versions of many common UNIX  
374 utilities into a single small executable, `sed` among them.
- 375     – License: GPLv2
- 376     – Debian: Present
- 377     – Apertis: Present
- 378     – GNU compatibility: Medium, only minimum set of features, but there  
379     are not much differences

## 380 Conclusion

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

## 384 Initial tests

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

- 387 • Boot target image with tools replaced
- 388 • Reinstall all the packages in target image

389 These tests were passed successfully which shows that the suggested approach  
390 is viable. Despite these promising results further testing should be conducted to  
391 assure a smooth transition.

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<sup>23</sup><https://github.com/rust-lang/flate2-rs>

<sup>24</sup><https://busybox.net/>