

Re-Py-ducible Builds

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PyCascades 2025-02-08

Who am I



	Vagrant
debian user	2001
debian developer	2010
reproducible builds	2015
guix contributor	2017
guix committer	2019

Reproducible Builds

<https://reproducible-builds.org/docs/definition/>

A build is reproducible if given the same source code, build environment and build instructions, any party can recreate bit-by-bit identical copies of all specified artifacts.

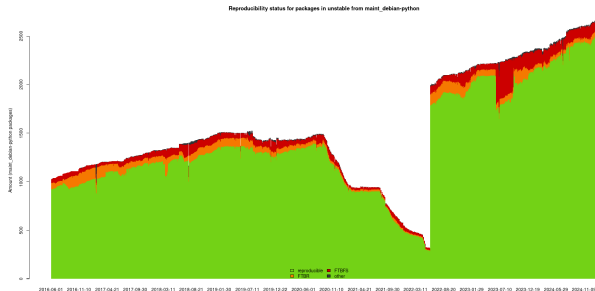


Python packages in Debian

Maintained by Debian Python team

https://tests.reproducible-builds.org/debian/unstable/amd64/pkg_set_maint_debian-python.html

- 2600+ Packages
- 94.5% reproducible



Debian sneaks around some of the problems

.pyc contain timestamps

```
diffoscope __pycache__.*/*.*.pyc
--- __pycache__.orig/foo.cpython-311.pyc
+++ __pycache__.orig2/foo.cpython-311.pyc
  Python bytecode
  @@ -1,4 +1,4 @@
   magic:      0xa70d0d0a
  -moddate:    0x64bd9267 (Thu Jan 23 22:06:28 2025 UTC)
  +moddate:    0xd2c59267 (Thu Jan 23 22:42:26 2025 UTC)
  files sz: 95
  code:       starts at offset 16 (size: 392 bytes)
```

Debian generates them at install time!

Python 3.7 invalidation-mode

Guix uses the invalidation-mode feature introduced in python 3.7

```
python -m compileall --invalidation-mode=unchecked-hash
```

Using a hash of the file rather than timestamps

<https://docs.python.org/3/library/compileall.html>

"The default is timestamp if the SOURCE_DATE_EPOCH environment variable is not set, and checked-hash if the SOURCE_DATE_EPOCH environment variable is set."

What time is it? What time was it? What is time?

<https://reproducible-builds.org/docs/source-date-epoch/>

"SOURCE_DATE_EPOCH is a standardised environment variable that distributions can set centrally and have build tools consume this in order to produce reproducible output."

wxmplot and the date the copyright stood still

<https://bugs.debian.org/1059013>

```
--- a/doc/conf.py
+++ b/doc/conf.py
...
+import time
-from datetime import date
...
+date_str = time.strftime(
+    "%Y-%m-%d",
+    time.gmtime(int(os.environ.get('SOURCE_DATE_EPOCH', time.time()))))
+)

-copyright = f'{date.today()}, Matthew Newville, The University of Chicago'
+copyright = f'{date_str}, Matthew Newville, The University of Chicago'
```

pympress and the mysterious memory dumps in your documentation

<https://bugs.debian.org/1068795>

```
--- pympress-1.8.5.orig/pympress/app.py
+++ pympress-1.8.5/pympress/app.py
...
-     def do_activate(self, timestamp=GLib.get_current_time()):
+     def do_activate(self, timestamp=None):
+         """ Activate: show UI windows.

Build them if they do not exist, otherwise bring to front.
"""

+         if timestamp is None:
+             timestamp = GLib.get_current_time()
+
+         if self.gui is None:
```

pympress wants to be a bit too thorough in documentation

The pympress docs contained:

```
OS:...Linux</span>·<span·class="pre">6.11.10+bpo-amd64...  
vs.  
OS:...Linux</span>·<span·class="pre">6.1.0-28-amd64...
```

pympress documenttton has your kernel right there in the code

And pympress code that put the kernel in the docs:

```
version_string = ' '.join([
    ...
    '; OS:', platform.system(), platform.release(), platform.version(),
```

Do we need the kernel version of where the documentation was built?

```
version_string = ' '.join([  
    ...  
    '; OS:', platform.system(), 'REDACTED', 'REDACTED',
```

Nahhh...

So a bunch of generated documentation was helpfully translated:

```
<span·class="pre">draw</span>·<span·class="pre">on</span>...
```

vs.

```
<span·class="pre">disegnare</span>·<span·class="pre">sulla</span>...
```

Stripping out the XML markup:

`draw on the current slide`

vs.

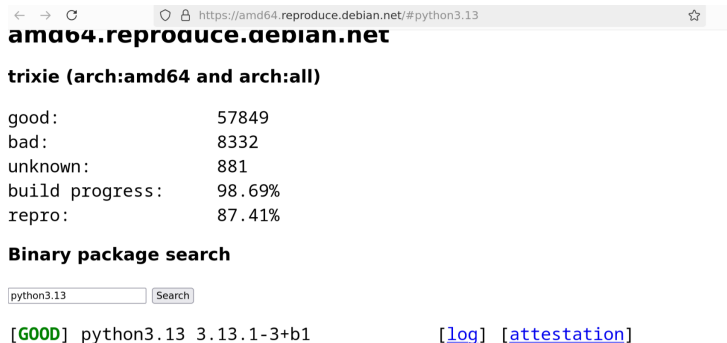
`disegnare sulla diapositiva corrente`

Workaround was to specify the `LANGUAGE` and other locale environment variables in the build environment.

The same snakes

`https://amd64.reproduce.debian.net/#python3.13`

Python 3.13 in
Debian is
Reproducible!



The screenshot shows a web browser window with the URL `https://amd64.reproduce.debian.net/#python3.13`. The page title is **amd64.reproduce.debian.net**. Below the title, it says **trixie (arch:amd64 and arch:all)**. A table of statistics is displayed:

good:	57849
bad:	8332
unknown:	881
build progress:	98.69%
repro:	87.41%

Below the table is a section titled **Binary package search**. It contains a search input field with the text `python3.13` and a `Search` button. Below the search bar, the results are shown: **[GOOD]** `python3.13 3.13.1-3+b1`. To the right of the results are two links: [\[log\]](#) and [\[attestation\]](#).

Not all snakes are the same

<https://tests.reproducible-builds.org/debian/rb-pkg/unstable/amd64/python3.13.html>

Or is it? Oh noes?
Some caveats
apply.

Filter by: amd64 arm64 armhf i386
https://tests.reproducible-builds.org/debian/rb-pkg/unstable/damd64/python3.13_3.13

Suite and Architecture

amd64

3.13.1-3 in trixie

3.13.2-1 in unstable

unreproducible

at 2025-02-06 01:44:00 UTC

differences (txt) (json)

buildinfo

rbuild (295KB) build2 (310KB) diff

arm64

3.13.1-3 in trixie

3.13.2-1 in unstable

armhf

Files

Offset 1, 19 lines modified	Offset 1, 19 lines modified
1 63750e6d31bfc3c242f961adae035cc6 441700 python optional idle-pyhton3.13_3.13.2-1_all.deb	1 63750e6d31bfc3c242f961adae035cc6 441700 python optional idle-pyhton3.13_3.13.2-1_all.deb
2 287b3182e3a3210b793a1934beb1442d 22909776 debug optional libpythn3.13-dbg_3.13.2-1_amd64.deb	2 287b3182e3a3210b793a1934beb1442d 22909776 debug optional libpythn3.13-dbg_3.13.2-1_amd64.deb
3 387209532d100e89989d899df3b5fbf9 5004712 libdevel optional libpyhton3.13-dev_3.13.2-1_amd64.deb	3 387209532d100e89989d899df3b5fbf9 5004712 libdevel optional libpyhton3.13-dev_3.13.2-1_amd64.deb
4 9be686eb5553b783dde23e6639d8b057 858964 python optional libpython3.13-minimal_3.13.2-1_amd64.deb	4 9be686eb5553b783dde23e6639d8b057 858964 python optional libpython3.13-minimal_3.13.2-1_amd64.deb
5 b0bdcae6ff73f7e89a70906642207a6d3 1978192 python optional libpythn3.13-stdlib_3.13.2-1_amd64.deb	5 b0bdcae6ff73f7e89a70906642207a6d3 1978192 python optional libpythn3.13-stdlib_3.13.2-1_amd64.deb
6 7e638ff3740b2f29ec4b222d932fc1c3 4630724 libdevel optional libpyhton3.13-testsuite_3.13.2-1_all.deb	6 7e638ff3740b2f29ec4b222d932fc1c3 4630724 libdevel optional libpyhton3.13-testsuite_3.13.2-1_all.deb
7 759b539f35fdcf29a5b113bccba25f681 2151924 libs optional libpython3.13_3.13.2-1_amd64.deb	7 759b539f35fdcf29a5b113bccba25f681 2151924 libs optional libpython3.13_3.13.2-1_amd64.deb
8 774ca91b2c38bf81ab4db12816079e49 54512224 debug optional pythn3.13-dbg_3.13.2-1_amd64.deb	8 774ca91b2c38bf81ab4db12816079e49 54512224 debug optional pythn3.13-dbg_3.13.2-1_amd64.deb

diffoscope diffs all the way down

```
diffoscope old/Re-Py-Ducible-Builds.pdf Re-Py-Ducible-Builds.pdf
```

```
--- old/Re-Py-Ducible-Builds.pdf
```

```
+++ Re-Py-Ducible-Builds.pdf
```

```
Document info
```

```
@@ -1,10 +1,10 @@
```

```
Author: 'Vagrant Cascadian <vagrant@reproducible-builds.org>'
```

```
-CreationDate: 'D:20250208223000Z'
```

```
+CreationDate: "D:20250207231847-08'00'"
```

```
Creator: 'Emacs 28.2 (Org mode 9.5.5)'
```

```
Keywords: ''
```

```
-ModDate: 'D:20250208223000Z'
```

```
+ModDate: "D:20250207231847-08'00'"
```

```
PTEX.Fullbanner: 'This is pdfTeX, Version 3.141592653-2.6-1.40.24 (TeX Live 2024)
```

```
Producer: 'pdfTeX-1.40.24'
```

```
Subject: ''
```

diffoscope html example

```
51431INSERT INTO targets VALUES('ttu.ee', 13611);
51432INSERT INTO "targets" VALUES('ttu.ee', 13611);
51433[ 9300 lines removed ]
60733CREATE TABLE git_commit
60734..... (git_commit TEXT);
60735INSERT INTO "git_commit" VALUES('cd09fb8c2161a
8d1280b848eaab3b14d35fe3044');
60736COMMIT;
```

```
51438INSERT INTO targets VALUES('ttu.ee', 13542);
51439INSERT INTO "targets" VALUES('ttu.ee', 13542);
51440[ 9314 lines removed ]
60754CREATE TABLE git_commit
60755..... (git_commit TEXT);
60756INSERT INTO "git_commit" VALUES('e78fe5d803208
bf6c877dc675cdb4f1b719e7519');
60757COMMIT;
```

install.rdf

Offset 5, 15 lines modified

```
5 .....<Description about="urn:mozilla:install-
manifest">
6 .....<em:name>HTTPS-Everywhere</em:name>
7 .....<em:creator>Mike Perry, Peter Eckersley,
&amp; Yan Zhu</em:creator>
8 .....<em:aboutURL>chrome://https-everywhere/
content/about.xul</em:aboutURL>
9 .....<em:id>https-everywhere@eff.org</em:id>
10 .....<em:type>2</em:type><!-- type:
Extension -->
.....<em:description>Encrypt the Web!
11 Automatically use HTTPS security on many sites.
</em:description>
12 .....<em:version>5.0.6</em:version>
13 .....<em:multiprocessCompatible>true</em:
```

Offset 5, 15 lines modified

```
5 .....<Description about="urn:mozilla:install-
manifest">
6 .....<em:name>HTTPS-Everywhere</em:name>
7 .....<em:creator>Mike Perry, Peter Eckersley,
&amp; Yan Zhu</em:creator>
8 .....<em:aboutURL>chrome://https-everywhere/
content/about.xul</em:aboutURL>
9 .....<em:id>https-everywhere@eff.org</em:id>
10 .....<em:type>2</em:type><!-- type:
Extension -->
.....<em:description>Encrypt the Web!
11 Automatically use HTTPS security on many sites.
</em:description>
12 .....<em:version>5.0.7</em:version>
13 .....<em:multiprocessCompatible>true</em:
```

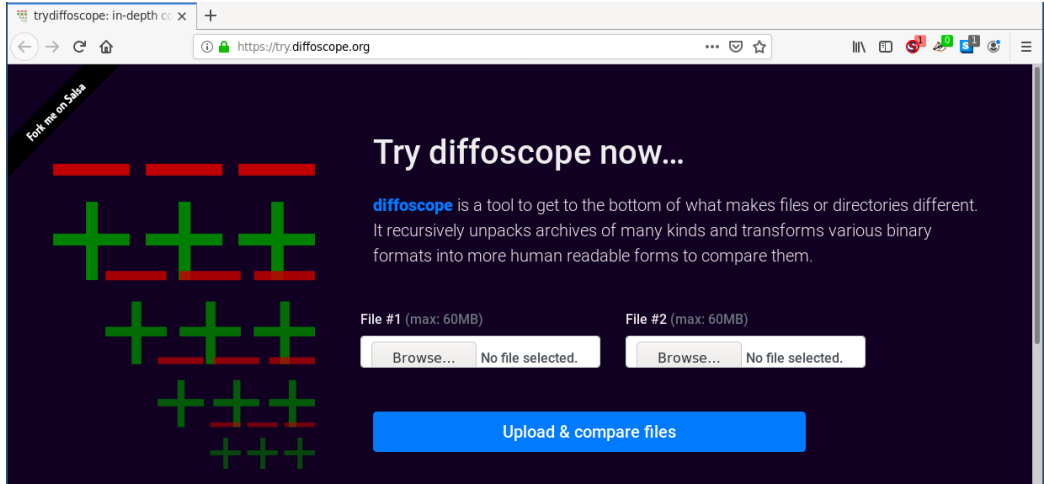
diffoscope, supported file types

Android APK files, Android boot images, Ar(1) archives, Berkeley DB database files, Bzip2 archives, Character/block devices, ColorSync colour profiles (.icc), Coreboot CBFS filesystem images, Cpio archives, Dalvik .dex files, Debian .buildinfo files, Debian .changes files, Debian source packages (.dsc), Device Tree Compiler blob files, Directories, ELF binaries, Ext2/ext3/ext4/btrfs filesystems, FreeDesktop Fontconfig cache files, FreePascal files (.ppu), Gettext message catalogues, GHC Haskell .hi files, GIF image files, Git repositories, GNU R database files (.rdb), GNU R Rscript files (.rds), Gnumeric spreadsheets, Gzipped files, ISO 9660 CD images, Java .class files, JavaScript files, JPEG images, JSON files, LLVM IR bitcode files, MacOS binaries, Microsoft Windows icon files, Microsoft Word .docx files, Mono 'Portable Executable' files, Ogg Vorbis audio files, OpenOffice .odt files, OpenSSH public keys, OpenWRT package archives (.ipk), PDF documents, PGP signed/encrypted messages, PNG images, PostScript documents, RPM archives, Rust object files (.deflate), SQLite databases, SquashFS filesystems, Statically-linked binaries, Symlinks, Tape archives (.tar), Tcpdump capture files (.pcap), Text files, TrueType font files, XML binary schemas (.xsb), XML files, XZ compressed files, etc.

try diffoscope online

And on the World Wide Web!

<https://try.diffoscope.org>



reptest example

```
reptest --verbose \  
  --vary=-fileordering,-domain_host \  
  --vary=-user_group,-time \  
  --auto-build \  
  auto -- null
```

- reproducibility build checks with extensive variations

reptest example

```
reptest --verbose \  
  --vary=-fileordering,-domain_host \  
  --vary=-user_group,-time \  
  --auto-build \  
auto -- null
```

- reproducibility build checks with extensive variations
- flexibly define which variations to use

reptest example

```
reptest --verbose \  
  --vary=-fileordering,-domain_host \  
  --vary=-user_group,-time \  
  --auto-build \  
auto -- null
```

- reproducibility build checks with extensive variations
- flexibly define which variations to use
- options to "bisect" with to identify nature of reproducibility issue

reprotest example

```
reprotest --verbose \  
  --vary=-fileordering,-domain_host \  
  --vary=-user_group,-time \  
  --auto-build \  
  auto -- null
```

- reproducibility build checks with extensive variations
- flexibly define which variations to use
- options to "bisect" with to identify nature of reproducibility issue
- needs maintenance and updating

Thanks

Help make it happen!

<https://reproducible-builds.org/contribute/>

<https://reproducible-builds.org/donate/>

<https://reproducible-builds.org/who/sponsors>

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