There and Back Again, Reproducibly!

Vagrant Cascadian and Holger Levsen

linuxdev-br, 2019-08-04

Who are we

	Vagrant	Holger
debian user	2001	1995
debian developer	2010	2007
reproducible builds	2015	2014

When we say reproducible

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.

Reproducible Builds

Humble beginnings

Unexpected guests

First Breakfast! Second Breakfast? Elevensies?

Elevensies!

openSUSE

QUBES OS

BuildRoot
Making Embedded Linux Easy

openembedded

OpenWrt
Wireless Freedom

GuixSD

Tails

yocto
PROJECT

NetBSD

Symfony

ElectroBSD

MONERO

Webconverger

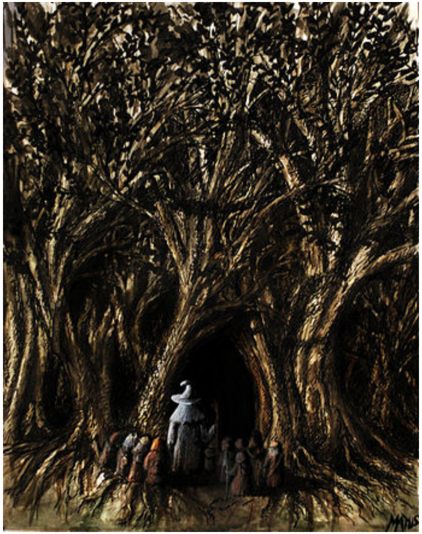
Dangerous Journeys

trolls

caves

Who does your hardware serve?

Dark and forboding places



spiders

Under the mountain

And back again

Who watches

The End . . . Or the Beginning?

Reproducible Builds

`https://reproducible-builds.org`

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- Then, in 2011 and 2012, Bitcoin and Torbrowser were made reproducible.
- Wow.

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- And every bit was known.
- Bit for bit reproducible GNU toolchain in the early 90s on 10(?) architectures.
- And then we all forgot.

Motivation for reproducible builds

- Why do we care?

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  - cannot detect flaws in sources
- see our previous talks where we explain motivation in greater detail, eg. look for 'a tale of three developers'

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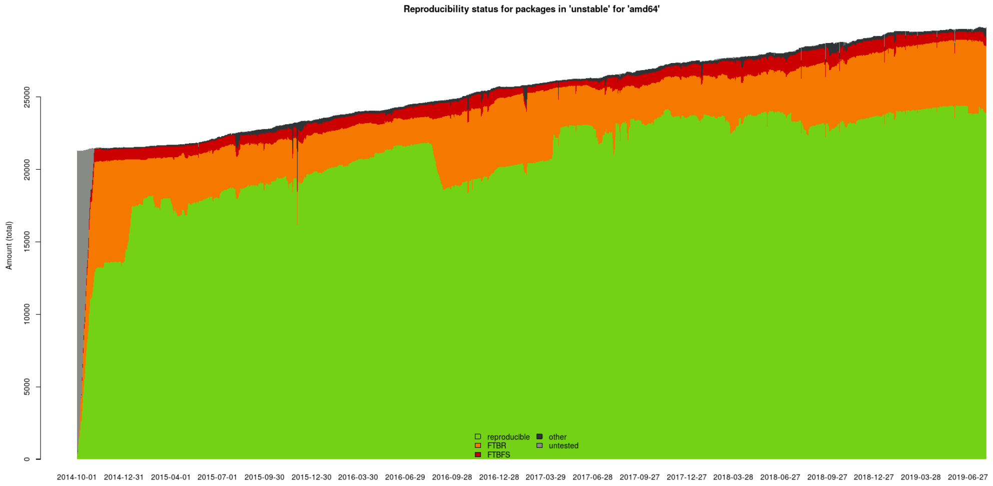
- Since 2017 in Debian Policy, as a "should" directive, not "must".
- 2023 with "must"?

Debian main unstable/amd64, since October 2014



Shared research and developments / WIP

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- Sharing issues, patches and upstreaming them.
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- More collaboration is possible!

What's causing unreproducibilities

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- hundreds of classes of causes !
- It's fun to discover these! Well, mostly.

A light at the end of the forest!

`https://diffoscope.org`

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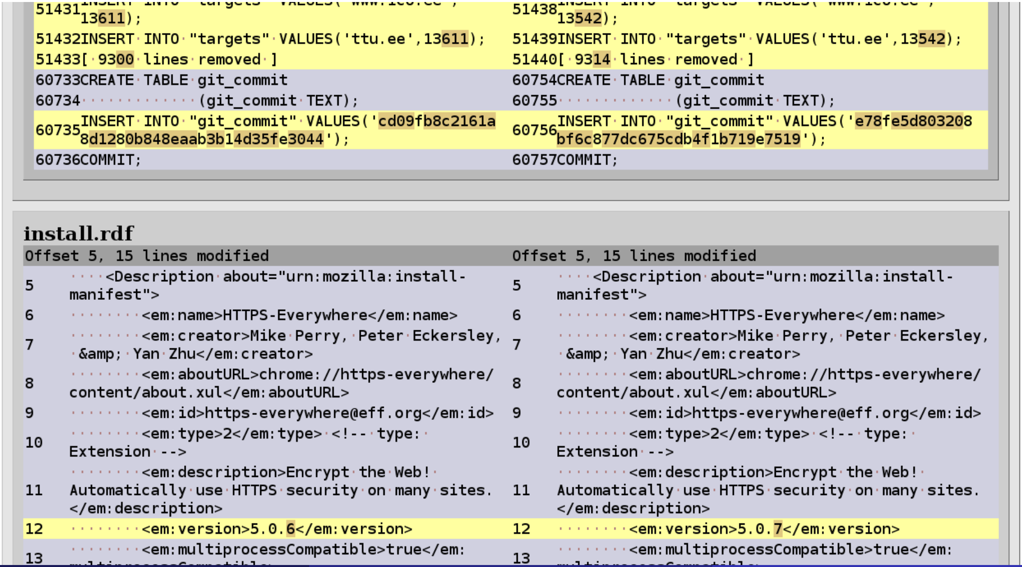
- Recursive and human-readable "diff"
    - locates and diagnoses reproducibility issues
    - not used for determining whether something is reproducible!
    - used for analysing why
- available for Debian, Fedora, OpenSUSE, Archlinux, GNU Guix, NixOS, FreeBSD, NetBSD, Homebrew, PypI, ...

diffoscope example



```
51431                                                        51438
     13611);                                                      13542);
51432INSERT·INTO·"targets"·VALUES('ttu.ee',13611);           51439INSERT·INTO·"targets"·VALUES('ttu.ee',13542);
51433[·9300·lines·removed·]                                  51440[·9314·lines·removed·]
60733CREATE·TABLE·git_commit                                 60754CREATE·TABLE·git_commit
60734·············(git_commit·TEXT);                         60755·············(git_commit·TEXT);
60735INSERT·INTO·"git_commit"·VALUES('cd09fb8c2161a          60756INSERT·INTO·"git_commit"·VALUES('e78fe5d803208
     8d1280b848eaab3b14d35fe3044');                               bf6c877dc675cdb4f1b719e7519');
60736COMMIT;                                                  60757COMMIT;
```

install.rdf

```
Offset 5, 15 lines modified                                  Offset 5, 15 lines modified
5    ····<Description·about="urn:mozilla:install-            5    ····<Description·about="urn:mozilla:install-
     manifest">                                                   manifest">
6    ········<em:name>HTTPS-Everywhere</em:name>             6    ········<em:name>HTTPS-Everywhere</em:name>
7    ········<em:creator>Mike·Perry,·Peter·Eckersley,        7    ········<em:creator>Mike·Perry,·Peter·Eckersley,
     ·&amp;·Yan·Zhu</em:creator>                                 ·&amp;·Yan·Zhu</em:creator>
8    ········<em:aboutURL>chrome://https-everywhere/         8    ········<em:aboutURL>chrome://https-everywhere/
     content/about.xul</em:aboutURL>                              content/about.xul</em:aboutURL>
9    ········<em:id>https-everywhere@eff.org</em:id>         9    ········<em:id>https-everywhere@eff.org</em:id>
10   ········<em:type>2</em:type>·<!--·type:·                10   ········<em:type>2</em:type>·<!--·type:·
     Extension·-->                                                Extension·-->
     ········<em:description>Encrypt·the·Web!·                    ········<em:description>Encrypt·the·Web!·
11   Automatically·use·HTTPS·security·on·many·sites.         11   Automatically·use·HTTPS·security·on·many·sites.
     </em:description>                                            </em:description>
12   ········<em:version>5.0.6</em:version>                  12   ········<em:version>5.0.7</em:version>
13   ········<em:multiprocessCompatible>true</em:            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!

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- diffoscope is useful beyond reproducible builds, eg.
  - for checking security updates only change what should be changed
  - for development too

A barrel in the river

reprotest: builds something twice with many variations

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- Please help!

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  - distributing trust
  - how to "Enable everyone to independently. . . " in practice. (eg for Debian there are two designs with code, but. . .)

Four summits so far

- Athens 2015

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Collaboration is so great, again.

Collaboration, again.

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- And we welcome you.
- And we welcome Free Software.

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- There are ideas and even code for the last 33%, but we can't go on that path without the first 66%...
- There is a lot to do. Please. Help.

Questions?

Thank you for your time and contributions.

It's been a long journey but we will get there. And back again, on to new journeys!

https://reproducible-builds.org
https://try.diffoscope.org

Copyright

Still hungry?

We could offer pizza. . .