

# You think you're not a target? A tale of 3 developers...

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FLOSSUK 2018  
26th April 2018  
Edinburgh, Scotland



Cambridge  
Analytica





Debian Project Leader

OpenSource.org Board Member

Free software developer for 10+ years

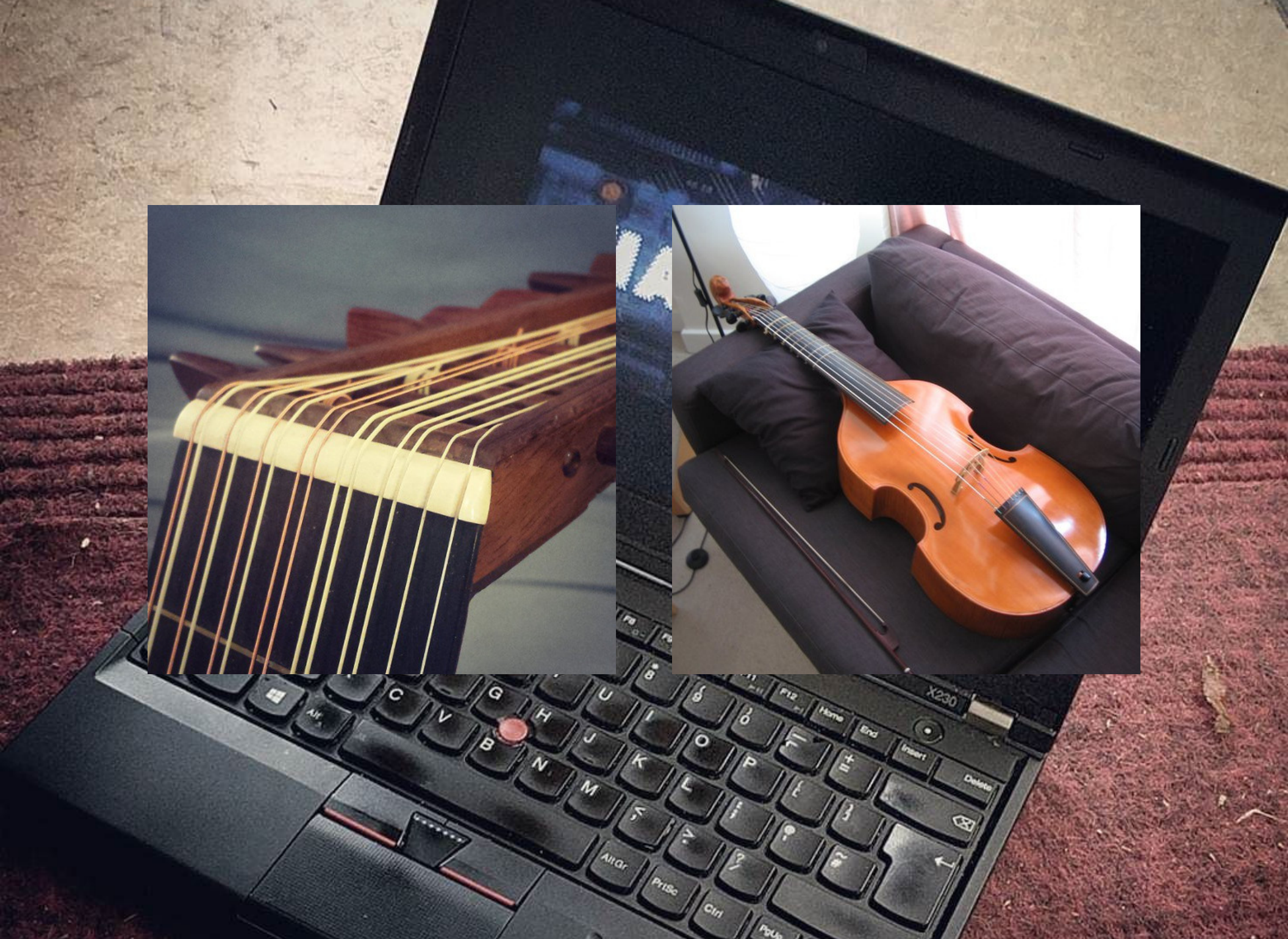
Freelance software developer

File Edit View Go Bookmarks Help

Previous Next 1 (1 of 1) 85%

7	8	4	1	9	3	6	5	2
9	1	2	5	7	6	3	8	4
6	3	5	8	4	2	1	7	9
4	5	7	6	3	9	2	1	8
8	9	3	7	2	1	5	4	6
2	6	1	4	5	8	9	3	7
3	2	8	9	1	4	7	6	5
5	4	9	3	6	7	8	2	1
1	7	6	2	8	5	4	9	3

Sudoku Solver in PostScript



**Three developers...**



Alice



```
lists... Done
dependency tree... Done
extra packages will be installed:
apache2-data apache2-utils file libalgorithm-c3-perl libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ld
extract-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libbareword-filehandles-perl libcgi-fast-perl lib
perl libclass-c3-xs-perl libclass-method-modifiers-perl libclass-xsaccessor-perl libcpan-changes-perl libcpan-me
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gnutls-deb0-28 libhogweed4 libhtml-parser-perl libhtml-tagset-perl libhttp-date-perl libhttp-message-perl libicu
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utils-perl liblog-message-perl liblog-message-simple-perl liblua5.1-0 liblwp-mediatypes-perl libmagic1 libmodule
plementation-perl libmodule-pluggable-perl libmodule-runtime-perl libmodule-signature-perl libmoo-perl libmoox-l
t-perl libmultidimensional-perl libnamespace-autoclean-perl libnamespace-clean-perl libnettle6 libnghttp2-14 lib
nstants-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl libparam
litate-perl libpath-tiny-perl libpod-latex-perl libpod-markdown-perl libpod-readme-perl librole-tiny-perl libsa
ules libsas12-modules-db libsoftware-license-perl libsqlite3-0 libssl1.0.2 libstrictures-perl libsub-exporter-pe
ter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libtasn1-6 libterm-ui-perl libtex
late-perl libtimedate-perl libtry-tiny-perl libtype-tiny-perl libtype-tiny-xs-perl libunicode-utf8-perl liburi-p
magic-perl libxml2 mime-support openssl perl perl-modules rename sgml-base ssl-cert xml-core
ages:
apache2-doc apache2-suexec-pristine apache2-suexec-custom gnutls-bin libdata-dump-perl libscalar-number-perl
ules-otp libsas12-modules-ldap libsas12-modules-ssl libsas12-modules-gssapi-mit libsas12-modules-gssapi-heimdal
cktrace-perl libwww-perl ca-certificates perl-doc libterm-readline-gnu-perl libterm-readline-perl make libl
dist-build-perl libcpanplus-perl libfile-checktime-perl libobject-accessor-perl sgml-base-doc openssl-blacklist
NEW packages will be installed:
apache2-bin apache2-data apache2-utils file libalgorithm-c3-perl libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libapr
extract-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libbareword-filehandles-perl libcgi-fast-perl lib
perl libclass-c3-xs-perl libclass-method-modifiers-perl libclass-xsaccessor-perl libcpan-changes-perl libcpan-me
ist-perl libdata-perl-perl libdata-section-perl libdevel-caller-perl libdevel-globaldestruction-perl libdevel-l
cale-perl libexpat1 libexporter-tiny-perl libfcgi-perl libffi6 libfile-slurp-perl libgdbm3 libgetopt-long-descri
gnutls-deb0-28 libhogweed4 libhtml-parser-perl libhtml-tagset-perl libhttp-date-perl libhttp-message-perl libicu
co-perl libindirect-perl libio-html-perl libio-stringy-perl libldap-2.4-2 liblexical-sealrequirehints-perl
utils-perl liblog-message-perl liblog-message-simple-perl liblua5.1-0 liblwp-mediatypes-perl libmagic1 libmodule
plementation-perl libmodule-pluggable-perl libmodule-runtime-perl libmodule-signature-perl libmoo-perl libmoox-l
t-perl libmultidimensional-perl libnamespace-autoclean-perl libnamespace-clean-perl libnettle6 libnghttp2-14 lib
nstants-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl libparam
litate-perl libpath-tiny-perl libpod-latex-perl libpod-markdown-perl libpod-readme-perl librole-tiny-perl libsa
ules libsas12-modules-db libsoftware-license-perl libsqlite3-0 libssl1.0.2 libstrictures-perl libsub-exporter-pe
ter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libtasn1-6 libterm-ui-perl libtex
late-perl libtimedate-perl libtry-tiny-perl libtype-tiny-perl libtype-tiny-xs-perl libunicode-utf8-perl liburi-p
magic-perl libxml2 mime-support openssl perl perl-modules rename sgml-base ssl-cert xml-core
4 newly installed, 0 to remove and 1 not upgraded.
8 MB of archives.
ration, 97.9 MB of additional disk space will be used.
continue? [Y/n] 
```

Bob





***Bob's Privacy Browser***

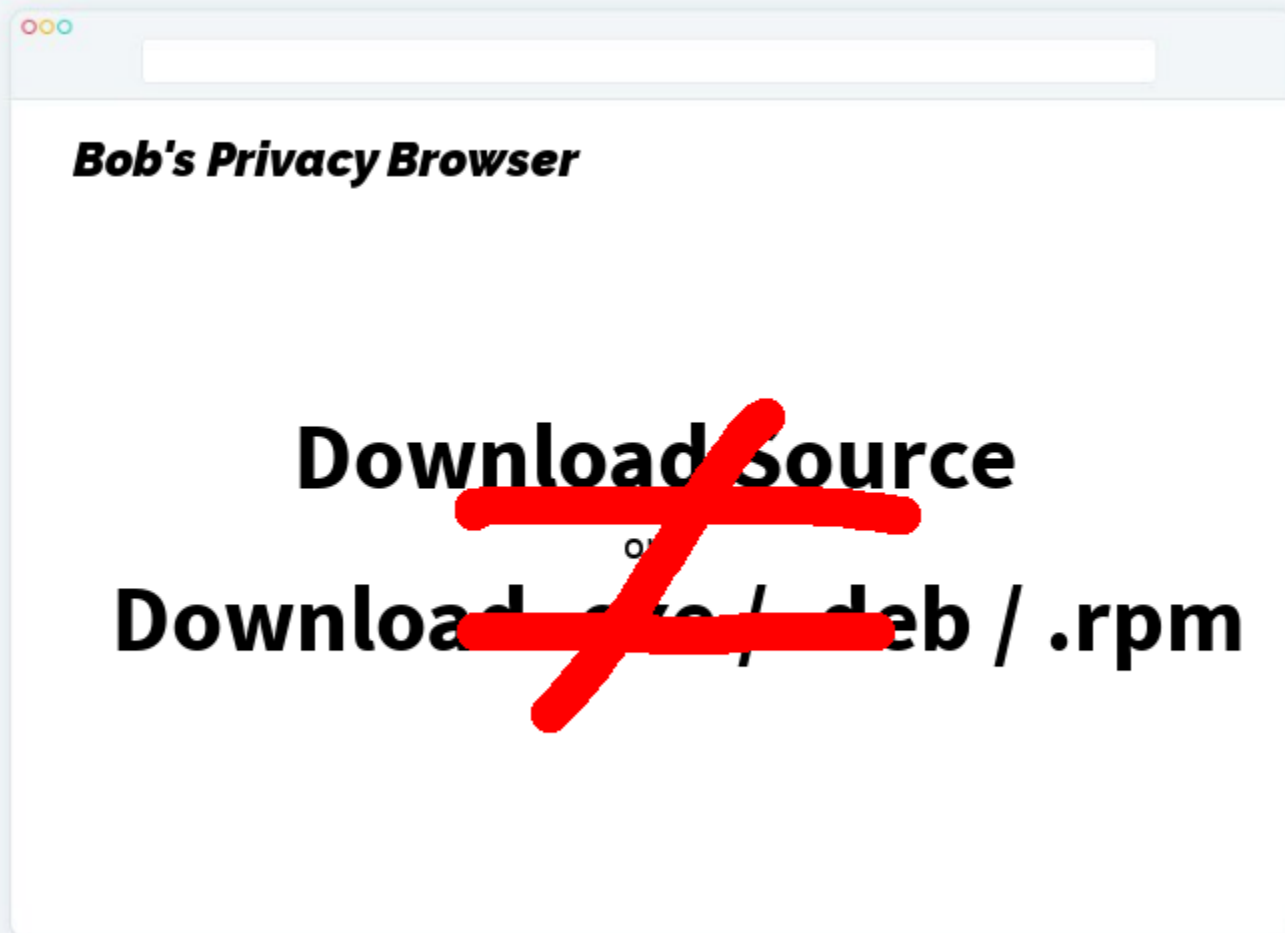
**Download Source**

or

**Download .exe / .deb / .rpm**

```
--- openssl-0.9.7e.orig/crypto/rand/rand_unix.c 2003-12-27 16:01:52.000000000 +0000
+++ openssl-0.9.7e/crypto/rand/rand_unix.c      2006-04-19 15:42:32.000000000 +0100
@@ -160,6 +160,9 @@
     const char **egdsocket = NULL;
 #endif

+    /* Keep valgrind happy */
+    memset(tmpbuf, 0, sizeof tmpbuf);
+
 #ifdef DEVRANDOM
     /* Use a random entropy pool device. Linux, FreeBSD and OpenBSD
      * have this. Use /dev/urandom if you can as /dev/random may block
```



**Bob's Privacy Browser**

**Download source**

**Download site / .deb / .rpm**



← Caro



Eve →

## The four essential freedoms

A program is free software if the program's users have the four essential freedoms:

- The freedom to run the program as you wish, for any purpose (freedom 0).
- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies **so you can help your neighbor** (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.



**Alice**

Servers attacked

**Bob**

Blackmailed

**Carol**

Compromised laptop

All are "good guys"  
My good guys are your...  
Disincentives to share

**Cannot trust their binaries**

Reading package lists... Done

Building dependency tree... Done

The following extra packages will be installed:

apache2-bin apache2-data apache2-utils file libalgorithm-c3-perl libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap  
libarchive-extract-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libbareword-filehandles-perl libbcgi-fast-perl libbcgi-pm-perl  
libclass-c3-perl libclass-c3-xs-perl libclass-method-modifiers-perl libclass-xs-accessor-perl libcpan-changes-perl libcpan-meta-perl  
libdata-optlist-perl libdata-perl-perl libdata-section-perl libdevel-caller-perl libdevel-globaldestruction-perl libdevel-lexalias-perl  
libencode-locale-perl libexpat1 libexporter-tiny-perl libfcgi-perl libffi6 libfile-slurp-perl libgdbm3 libgetopt-long-descriptive-perl  
libgmp10 libgnutls-deb0-28 libhogweed4 libhtml-parser-perl libhtml-tagset-perl libhttp-date-perl libhttp-message-perl libicu55  
libimport-into-perl libindirect-perl libio-html-perl libio-stringy-perl libldap-2.4-2 liblexical-sealrequirehints-perl  
liblist-moreutils-perl liblog-message-perl liblog-message-simple-perl liblua5.1-0 liblwp-mediatypes-perl libmagic1 libmodule-build-perl  
libmodule-implementation-perl libmodule-pluggable-perl libmodule-runtime-perl libmodule-signature-perl libmoo-perl libmoox-handlesvia-perl  
libmro-compat-perl libmultidimensional-perl libnamespace-autoclean-perl libnamespace-clean-perl libnettle6 libnghttp2-14 libp11-kit0  
libpackage-constants-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl libparams-util-perl  
libparams-validate-perl libpath-tiny-perl libpod-latex-perl libpod-markdown-perl libpod-readme-perl librole-tiny-perl libsas12-2  
libsas12-modules libsas12-modules-db libsoftware-license-perl libsqlite3-0 libssl1.0.2 libstrictures-perl libsub-exporter-perl  
libsub-exporter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libtasn1-6 libterm-ui-perl libtext-soundex-perl  
libtext-template-perl libtimedate-perl libtry-tiny-perl libtype-tiny-perl libtype-tiny-xs-perl libunicode-utf8-perl liburi-perl  
libvariable-magic-perl libxml2 mime-support openssl perl perl-modules rename sgml-base ssl-cert xml-core

Suggested packages:

www-browser apache2-doc apache2-mpm-itk apache2-suexec-minimal sasl-bin libapache2-mod-authn-sasl libapache2-mod-authn-xmllite  
libsas12-modules libsas12-modules-db libsoftware-license-perl libsqlite3-0 libssl1.0.2 libstrictures-perl libsub-exporter-perl  
libdevel-stacktrace-perl libwww-perl ca-certificates perl-doc libterm-readline-gnu-perl libterm-readline-perl-perl make libb-lint-perl  
libcpanplus-dist-build-perl libcpanplus-perl libfile-checktree-perl libobject-accessor-perl sgml-base-doc openssl-blacklist debhelper

The following NEW packages will be installed:

apache2 apache2-bin apache2-data apache2-utils file libalgorithm-c3-perl libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap  
libarchive-extract-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libbareword-filehandles-perl libbcgi-fast-perl libbcgi-pm-perl  
libclass-c3-perl libclass-c3-xs-perl libclass-method-modifiers-perl libclass-xs-accessor-perl libcpan-changes-perl libcpan-meta-perl  
libdata-optlist-perl libdata-perl-perl libdata-section-perl libdevel-caller-perl libdevel-globaldestruction-perl libdevel-lexalias-perl  
libencode-locale-perl libexpat1 libexporter-tiny-perl libfcgi-perl libffi6 libfile-slurp-perl libgdbm3 libgetopt-long-descriptive-perl  
libgmp10 libgnutls-deb0-28 libhogweed4 libhtml-parser-perl libhtml-tagset-perl libhttp-date-perl libhttp-message-perl libicu55  
libimport-into-perl libindirect-perl libio-html-perl libio-stringy-perl libldap-2.4-2 liblexical-sealrequirehints-perl  
liblist-moreutils-perl liblog-message-perl liblog-message-simple-perl liblua5.1-0 liblwp-mediatypes-perl libmagic1 libmodule-build-perl  
libmodule-implementation-perl libmodule-pluggable-perl libmodule-runtime-perl libmodule-signature-perl libmoo-perl libmoox-handlesvia-perl  
libmro-compat-perl libmultidimensional-perl libnamespace-autoclean-perl libnamespace-clean-perl libnettle6 libnghttp2-14 libp11-kit0  
libpackage-constants-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl libparams-util-perl  
libparams-validate-perl libpath-tiny-perl libpod-latex-perl libpod-markdown-perl libpod-readme-perl librole-tiny-perl libsas12-2  
libsas12-modules libsas12-modules-db libsoftware-license-perl libsqlite3-0 libssl1.0.2 libstrictures-perl libsub-exporter-perl  
libsub-exporter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libtasn1-6 libterm-ui-perl libtext-soundex-perl  
libtext-template-perl libtimedate-perl libtry-tiny-perl libtype-tiny-perl libtype-tiny-xs-perl libunicode-utf8-perl liburi-perl  
libvariable-magic-perl libxml2 mime-support openssl perl perl-modules rename sgml-base ssl-cert xml-core

0 upgraded, 114 newly installed, 0 to remove and 1 not upgraded.

Need to get 23.8 MB of archives.

After this operation, 97.9 MB of additional disk space will be used.

Do you want to continue? [Y/n]

# General problem

## Can view source code for malicious flaws

## Users install pre-compiled packages

## Can we trust the compilation process?

# Hacker explains how he put "backdoor" in hundreds of Linux Mi Downloads

The hacker said their prime motivation for the backdoor was to build a botnet.

Solution?

By [Zack Whittaker](#) for [Zero Day](#) | February 22, 2016 -- 01:28 GMT (01:28 GMT) | Topic: [Security](#)



2. Ensure builds always  
to Cloud Solutions & Processes

3. Compare results

Webinar  
7 | 5:00 pm CEST

[REGISTER NOW](#)

Agnes Valkova  
Marketing Manager

## Free Resco Cloud Webinar

Get run through all the solutions Resco Cloud has to offer and who benefits from which.

David



7a482b984883990bd4ab2ac5985630886cc252c

David



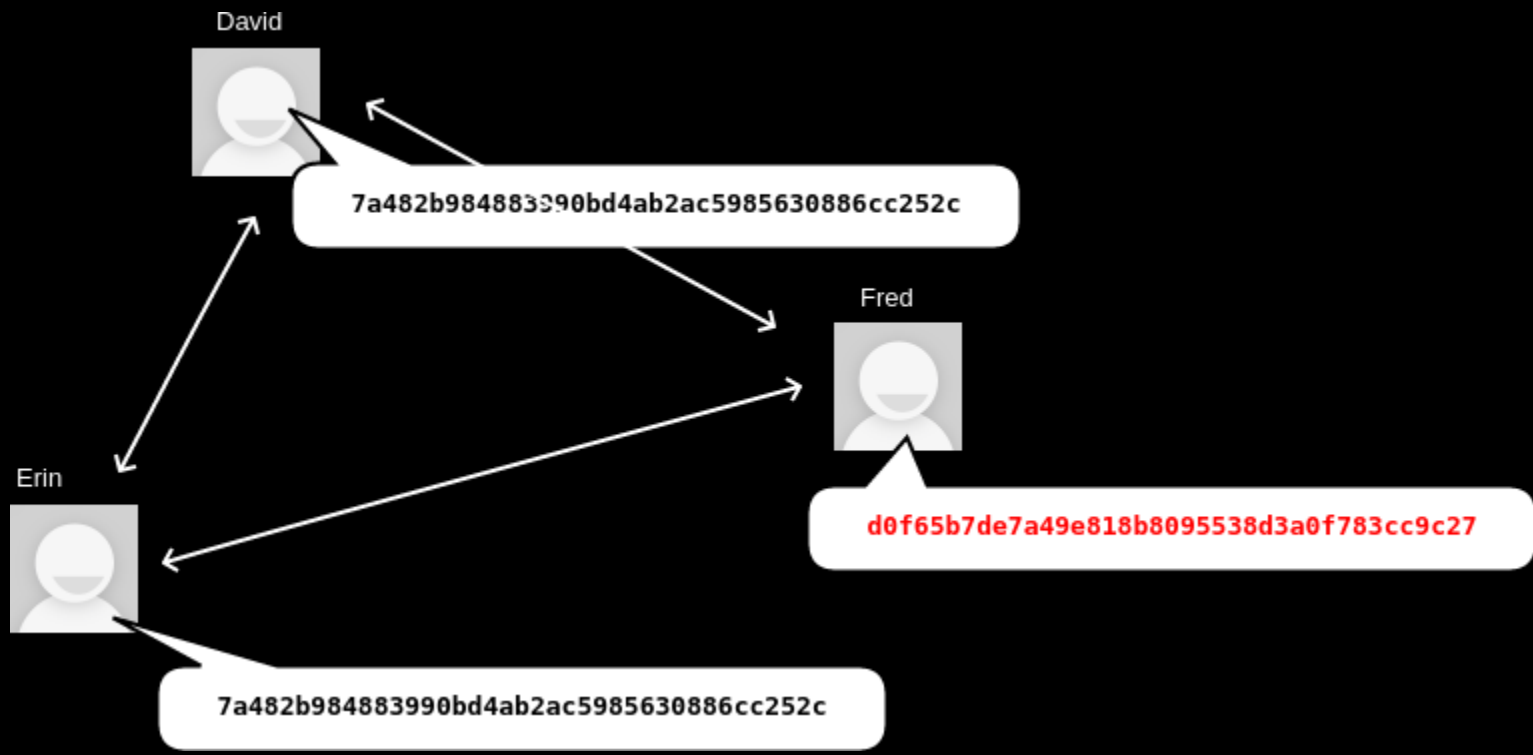
7a482b984883990bd4ab2ac5985630886cc252c

Erin



7a482b984883990bd4ab2ac5985630886cc252c





# How does this help?

Alice → Attack detected

Bob → Blackmail uncovered

Carol → Compromised laptop detected

**Reduces incentive to attack in the first place**



"Builds with the same dependencies"... ✘

"Reliable" builds... ✘

**Identical build results**

**Wait...**

Timestamps

Users, groups, umask, environment variables, etc.

Build paths

File ordering

Dictionary key ordering

Parallelism in build output

**Other advantages?**

Minimal diffs on "deliberate" changes

Find unnecessary build-dependencies

Cache ratio — save time, money & CO<sub>2</sub>

Finds bugs ahead of time

# Predictable OpenID secret

```
# Build.PL
$build->config_data(OpenIDConsumerSecret=>int(1e15*rand(.)));

# /usr/share/perl5/GBrowse/ConfigData.pm
{
  'OpenIDConsumerSecret' => '639098210478536',
  'cgibin' => '/usr/lib/cgi-bin/gbrowse',
  'conf' => '/etc/gbrowse',
  [...]
},
```

Every installation of this build shared the same secret

The Debian logo, a red spiral, is positioned behind the text.

# Debian & reproducible builds

# Torture test

Time & date

Hostname & domain name

Filesystem (disorderfs)

Timezone & locale

uid & gid

Kernel & CPU type



First rebuild in 2013

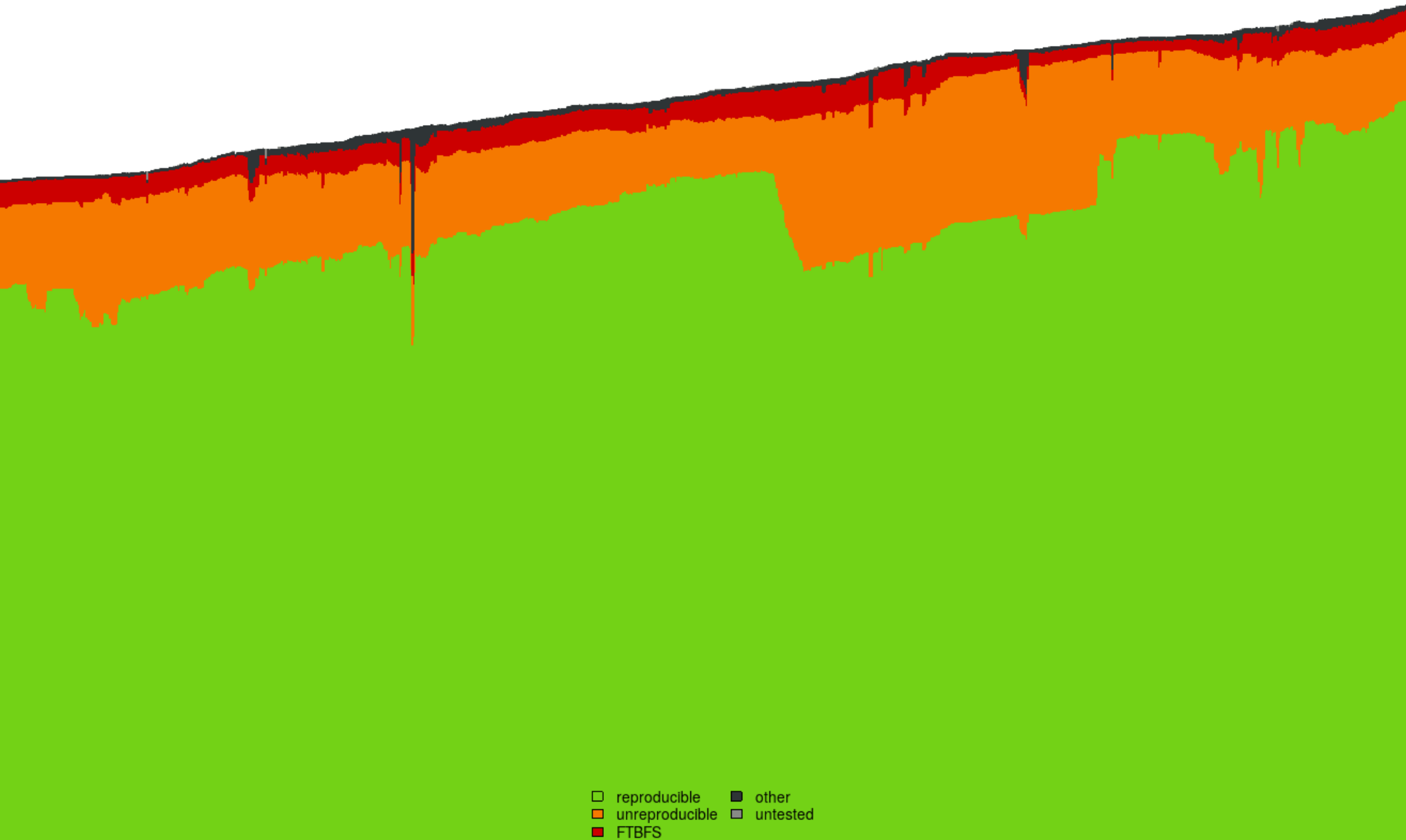
24% packages reproducible

---

March 2018

93% packages reproducible

# Reproducibility status for packages in 'unstable' for 'amd64'



2015-02-12 2015-04-20 2015-06-26 2015-09-01 2015-11-07 2016-01-13 2016-03-20 2016-05-26 2016-08-01 2016-10-07 2016-12-13 2017-02-18 2017-04-26 2017-07-02 2017-09-07 2017-11-12

A red spiral graphic, resembling a stylized 'e' or a similar character, is positioned behind the text. It starts from a central point and winds outwards in a clockwise direction, with a slight 3D effect and a dark red color.

**[isdebianreproducible.net.com](http://isdebianreproducible.net.com)**

# Beyond Debian...

coreboot, Fedora, LEDE, OpenWRT, NetBSD, FreeBSD, Archlinux, Qubes, F-Droid, NixOS, Guix, Meson, etc.

Reproducible Builds summits (Athens, Berlin)

```
# diff -urNad file1 file2
--- file1    2017-06-18 12:37:03.179186661 +0800
+++ file2    2017-06-18 12:37:04.811193648 +0800
@@ -1 +1 @@
-This is the first file.
+This is the second file.
```

```

$ diff -urNad a.deb b.deb | head -n10
--- a.deb          2018-01-23 11:47:11.829950207 +1100
+++ b.deb          2018-01-23 11:47:16.333977828 +1100
@@ -1,603 +1,643 @@
 !<arch>
 debian-binary    1496485532  0      0      100644  4
 2.0
 -control.tar.xz  1496485532  0      0      100644  1664
 -7zXZF
      P! 4M' ]
      >y&Y0x$rD-<j_
+control.tar.xz  1496485532  0      0      100644  1668
+7zXZF
      P!  ' ]
      >y&Y0x$rD-<j_

```

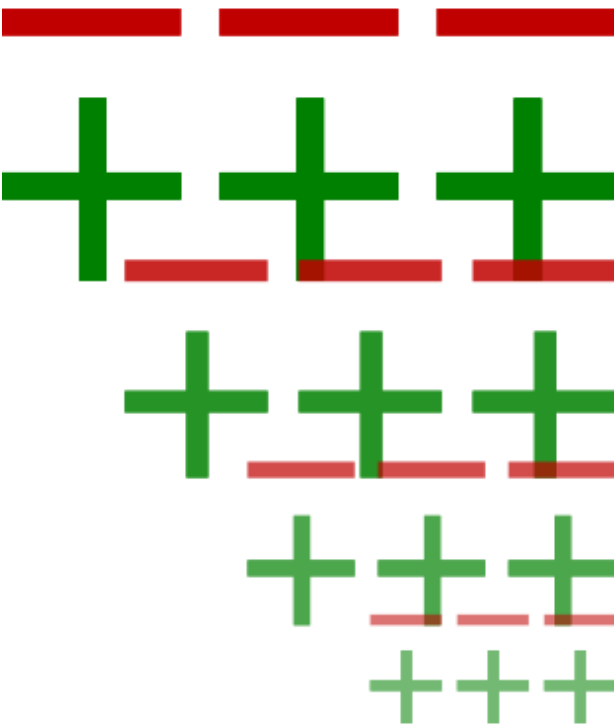
**I SHOULD BUILD A BETTER DIFF**



# diffoscope

in-depth comparison of files, archives, and directories

*diffoscope* will try to get to the bottom of what makes files or directories different. It will recursively unpack archives of many kinds and transform various binary formats into more human readable form to compare them. It can compare two tarballs, ISO images, or PDF just as easily.



```
51431INSERT INTO "targets" VALUES('ttu.ee',13611); 51438INSERT INTO "targets" VALUES('ttu.ee',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
60734..... (git_commit TEXT); 60754CREATE TABLE git_commit
60755..... (git_commit TEXT);
60735INSERT INTO "git_commit" VALUES('cd09f0bc2161a
6073681206b848eaab3b14d35f43044'); 60756INSERT INTO "git_commit" VALUES('e78fe5d803208
60757bf6c877dc675c0b4f15719e7519');
60736COMMIT; 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 -->
11.....<em:description>Encrypt the Web!
Automatically use HTTPS security on many sites.
</em:description>
```

```
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
60757bf6c877dc675c0b4f15719e7519');
60757COMMIT;
```

```
control.tar.gz
- edSignatures
- Files in package differs

data.tar.xz
./usr/lib/aspell/de_affix.dat
@ -1.11 +1.11 @@
# this is the affix file of the de_DE
# derived from the Igerxan08 dictiona
#
-# Version: 20131206 (build 20150801)
+# Version: 20131206 (build 20150802)
#
# Copyright (C) 1998-2011 Bjoern Jack
#
# License: GPLV2, GPLv3 or OASIS dist
# There should be a copy of all of th
# with every distribution of this dic
# versions using the GPL may only inc
./usr/share/aspell/de-common.cwl.gz
- metadata
```

<https://diffoscope.org/>



```

├─ aspell-de_20131206-5_all.deb
│  └─ metadata
│     rw-r--r-- 0/0      4 Jun 11 16:19 2014 debian-binary
│     -rw-r--r-- 0/0    2893 Jun 11 16:19 2014 control.tar.gz
│     -rw-r--r-- 0/0  329600 Jun 11 16:19 2014 data.tar.xz
│     +rw-r--r-- 0/0    2875 Jun 11 16:19 2014 control.tar.gz
│     +rw-r--r-- 0/0  329596 Jun 11 16:19 2014 data.tar.xz
│  └─ control.tar.gz
│     └─ control.tar
│        └─ md5sums
│           ── Files in package differ
│  └─ data.tar.xz
│     └─ data.tar
│        └─ ./usr/lib/aspell/de_affix.dat
│           #
│           -# Version: 20131206 (build 20150801)
│           +# Version: 20131206 (build 20150802)
│           #
│        └─ ./usr/share/aspell/de-common.cwl.gz
│           └─ metadata
│              -gzip compressed data, last modified: Sat Aug  1 18:21
│              +gzip compressed data, last modified: Sat Aug  1 18:24

```

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.

Security uploads

Binary blobs (eg. router images)

diffoscope  $\neq$  definition of reproducible

Fork me on GitHub



## Try diffoscope now...

**diffoscope** is a tool to get to the bottom of what makes files or directories different. It recursively unpacks archives of many kinds and transforms various binary formats into more human readable forms to compare them.

File #1 (max: 60MB)

Choose file No f...sen

File #2 (max: 60MB)

Choose file No f...sen

Upload & compare files

# try.diffoscope.org

**What's left to do?**

# Source code

Backdoors

Programming errors

Weak algorithms

Code with "testing" modes

```
$ apt install python-pywt-doc
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  python-pywt-doc
0 upgraded, 1 newly installed, 0 to remove and 4 not upgraded
Need to get 102 kB of archives.
After this operation, 978 kB of additional disk space will be used.
WARNING: The following packages are not reproducible!
  python-pywt-doc
Install these packages anyway? [y/N]
```

Toolchain fixes (GCC, OCaml, R, etc.)

Improving developer tools

Distribution policy changes

Defeating *Trusting Trust*...?



# Get involved!

Visit: [reproducible-builds.org](http://reproducible-builds.org)

Follow: [@ReproBuilds](https://twitter.com/ReproBuilds) on Twitter

Join: [#reproducible-builds](https://reproducible-builds)  
on [irc.oftc.net](https://irc.oftc.net)

*Thank you!*



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lamby@debian.org

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reproducible-builds.org

LQMB7