# Debsources

## Dive into Debian source code!

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MiniDebconf (Lyon, France)

# Acknowledgements

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Initially developped at IRILL, by Stefano Zacchiroli and myself. Many persons have contributed patches since then.

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### Slides

Inspired by Stefano Zacchiroli's previous presentations.
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# Table of contents

1. Introduction
2. Features
   - Debsources' features
   - What's new?
   - Roadmap
3. Technologies
4. Research platform
5. Hacking

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# What is Debsources?

- A web application to browse the source code of Debian packages
- The infrastructure behind: database, plugins, ...

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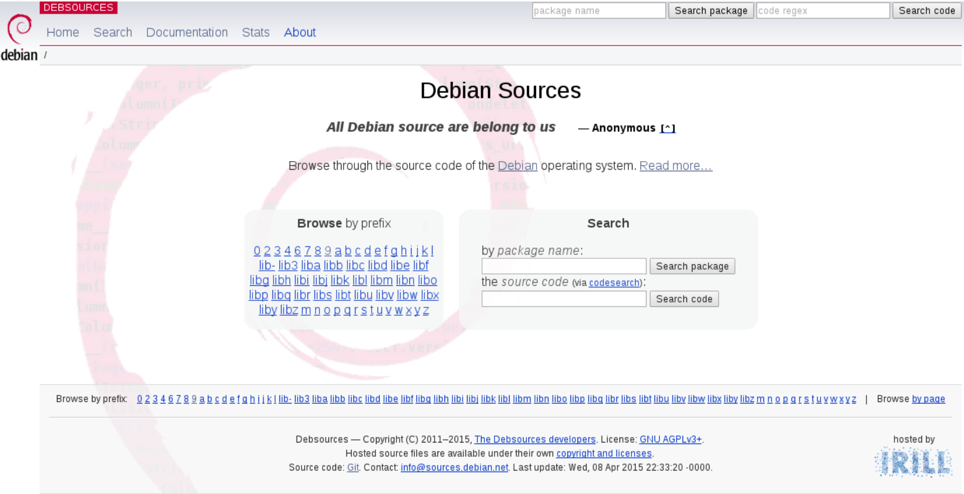
**Play with it!**

Navigate to `http://sources.debian.net`

# Home page



## Debian Sources

***All Debian source are belong to us*** — **Anonymous** [^]

Browse through the source code of the Debian operating system. Read more…

**Browse** by prefix

0 2 3 4 6 7 8 9 a b c d e f g h i j k l lib- lib3 liba libb libc libd libe libf libg libh libi libj libk libl libm libn libo libp libq libr libs libt libu libv libw libx liby libz m n o p q r s t u v w x y z

**Search**

by *package name*:

Search package

the *source code* (via codesearch):

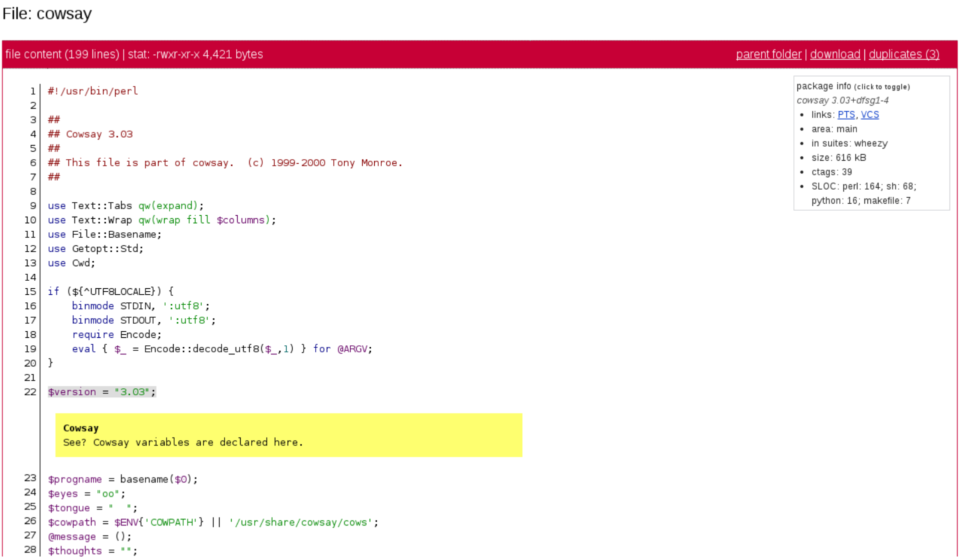
Search code

Browse by prefix: 0 2 3 4 6 7 8 9 a b c d e f g h i j k l lib- lib3 liba libb libc libd libe libf libg libh libi libj libk libl libm libn libo libp libq libr libs libt libu libv libw libx liby libz m n o p q r s t u v w x y z | Browse by page

Debsources — Copyright (C) 2011–2015, The Debsources developers. License: GNU AGPLv3+.
Hosted source files are available under their own copyright and licenses.
Source code: Git. Contact: info@sources.debian.net. Last update: Wed, 08 Apr 2015 22:33:20 -0000.

hosted by IRILL

# Source code display



File: cowsay

file content (199 lines) | stat: -rwxr-xr-x 4,421 bytes

parent folder | download | duplicates (3)

package info (click to toggle)

*cowsay 3.03+dfsg1-4*

- links: PTS, VCS
- area: main
- in suites: wheezy
- size: 616 kB
- ctags: 39
- SLOC: perl: 164; sh: 68; python: 16; makefile: 7

```
#!/usr/bin/perl

##
## Cowsay 3.03
##
## This file is part of cowsay.  (c) 1999-2000 Tony Monroe.
##

use Text::Tabs qw(expand);
use Text::Wrap qw(wrap fill $columns);
use File::Basename;
use Getopt::Std;
use Cwd;

if (${^UTF8LOCALE}) {
    binmode STDIN, ':utf8';
    binmode STDOUT, ':utf8';
    require Encode;
    eval { $_ = Encode::decode_utf8($_,1) } for @ARGV;
}

$version = "3.03";
```

**Cowsay**
See? Cowsay variables are declared here.

```
$progname = basename($0);
$eyes = "oo";
$tongue = "  ";
$cowpath = $ENV{'COWPATH'} || '/usr/share/cowsay/cows';
@message = ();
$thoughts = "";
```

# So what?

## Is this really useful?

"I want to check the source code of *cowsay*. What do?"

### The old way

```
cd /tmp
apt-get source cowsay
cd cowsay-3.03+dfsg1
...
cd ..
rm -r cowsay-3.03+dfsg1
```

Note that it only works with Debian-based systems, and not with your iPhone$^{TM}$.

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Note that it only works with Debian-based systems, and not with your iPhone™.

### The new way

```
lynx http://sources.debian.net/src/cowsay/
```

Almost runs on your typewriter.

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# Source code browsing

## Syntax highlighting

For all languages supported by highlight.js: C, C++, Java, Python, Ruby, Makefile... and 112 others.

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For all languages supported by highlight.js: C, C++, Java, Python, Ruby, Makefile... and 112 others.

## Included versions

Packages in
`hamm`, `sink`, `potato`, `woody`, `sarge`, `etch`, `lenny`, `squeeze`, `wheezy`, `jessie (testing)`, `unstable`, `experimental`, `oldstable-updates`, `stable-updates`, `proposed-updates`, `testing-proposed-updates`, `wheezy-backports`, `squeeze-lts`
are in Debsources.

# Searching

You can search for:

- Packages
- Files
- File content
  - ctags
  - regular expressions through `codesearch.debian.net`

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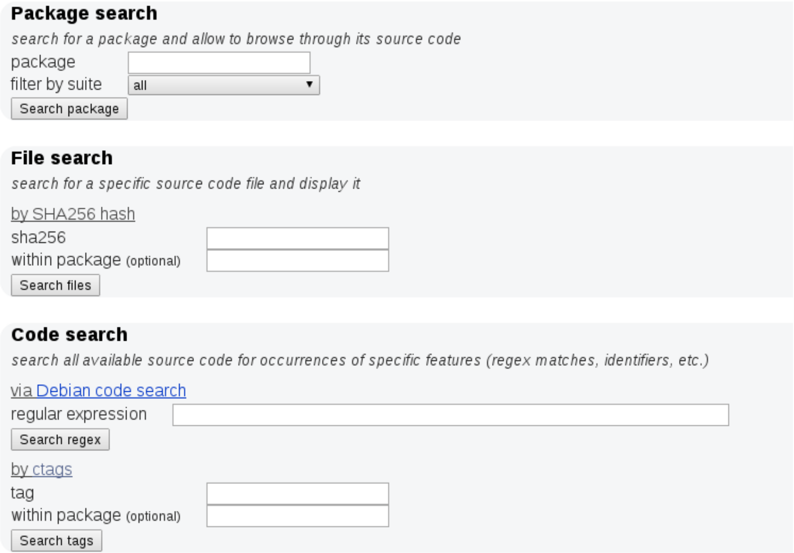
### Content indexing

Searching is fast, thanks to PostgreSQL's indexes.

# Advanced search



**Package search**

*search for a package and allow to browse through its source code*

package

filter by suite: all

**File search**

*search for a specific source code file and display it*

by SHA256 hash

sha256

within package (optional)

**Code search**

*search all available source code for occurrences of specific features (regex matches, identifiers, etc.)*

via Debian code search

regular expression

by ctags

tag

within package (optional)

# Annotations and highlighting

### Suppose...

- I'm a developer: *I want to share a precise location in the source code of package X.*
- I'm a user: *I can't compile software X, it fails at line 42 in the file Y.*
- I'm a static source code analyzer: *I found a semantic error in file Y.*

# Annotations and highlighting

`http://sources.debian.net/src/`
**`package/version/path/to/file.c`**`?hl=`**`a:b`**`&msg=`**`a:b:c`**`#L`**`XX`**

# Annotations and highlighting

http://sources.debian.net/src/ **package/version/path/to/file.c**?hl=**a:b**&msg=**a:b:c**#L**XX**

| | |
|---|---|
| package: | cowsay |
| version: | 3.03-3 |
| path: | cowsay |
| highlight: | 32:36 |
| message: | 30:Debian:rocks |

# Annotations and highlighting

http://sources.debian.net/src/
**package/version/path/to/file.c**?hl=**a:b**&msg=**a:b:c**#L**XX**

| | |
|---|---|
| package: | cowsay |
| version: | 3.03-3 |
| path: | cowsay |
| highlight: | 32:36 |
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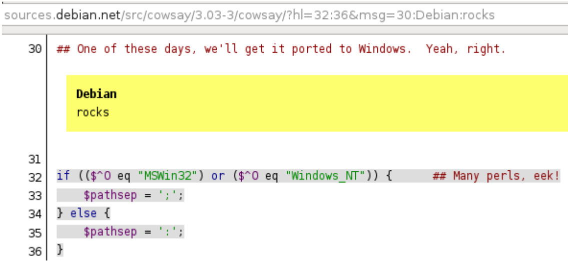
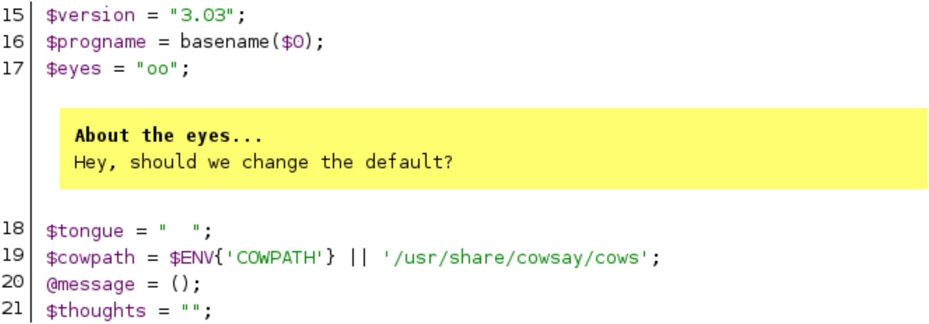


sources.debian.net/src/cowsay/3.03-3/cowsay/?hl=32:36&msg=30:Debian:rocks

```
30  ## One of these days, we'll get it ported to Windows.  Yeah, right.

      Debian
      rocks

31
32  if (($^O eq "MSWin32") or ($^O eq "Windows_NT")) {      ## Many perls, eek!
33      $pathsep = ';';
34  } else {
35      $pathsep = ':';
36  }
```

# Annotations and highlighting

Developer: I want to share a precise location in the source code of package X.



```
$version = "3.03";
$progname = basename($0);
$eyes = "oo";
```

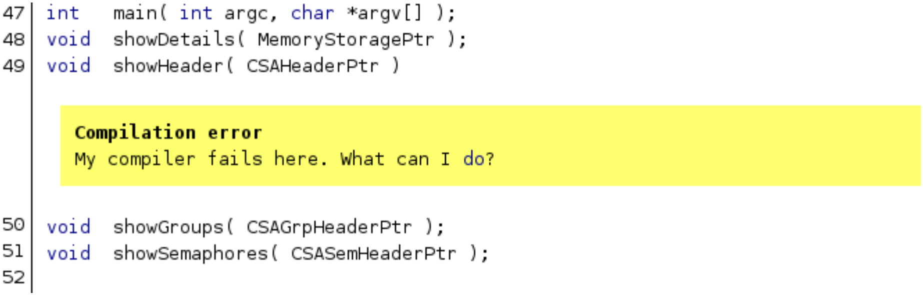
**About the eyes...**

Hey, should we change the default?

```
$tongue = "  ";
$cowpath = $ENV{'COWPATH'} || '/usr/share/cowsay/cows';
@message = ();
$thoughts = "";
```

# Annotations and highlighting

User: I can't compile software X, it fails at line 42 in the file Y.



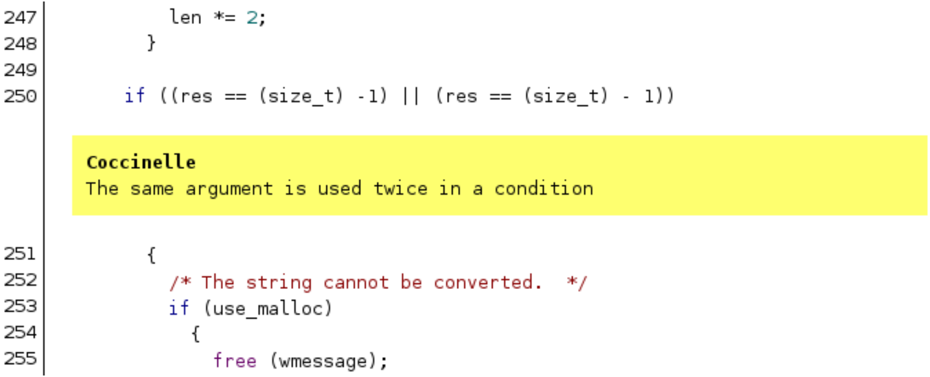
```
int   main( int argc, char *argv[] );
void  showDetails( MemoryStoragePtr );
void  showHeader( CSAHeaderPtr )
```

**Compilation error**
My compiler fails here. What can I do?

```
void  showGroups( CSAGrpHeaderPtr );
void  showSemaphores( CSASemHeaderPtr );
```

# Annotations and highlighting

Static analyzer: I found a semantic error in file Y.



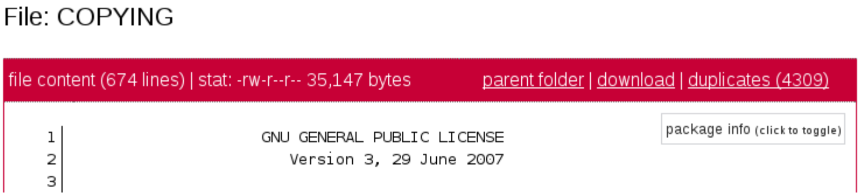
```
        len *= 2;
      }

    if ((res == (size_t) -1) || (res == (size_t) - 1))
```

**Coccinelle**
The same argument is used twice in a condition

```
      {
        /* The string cannot be converted.  */
        if (use_malloc)
          {
            free (wmessage);
```

# Duplicated files

All the files are in the database, along with their checksum.
The duplicates can be computed, for every file.



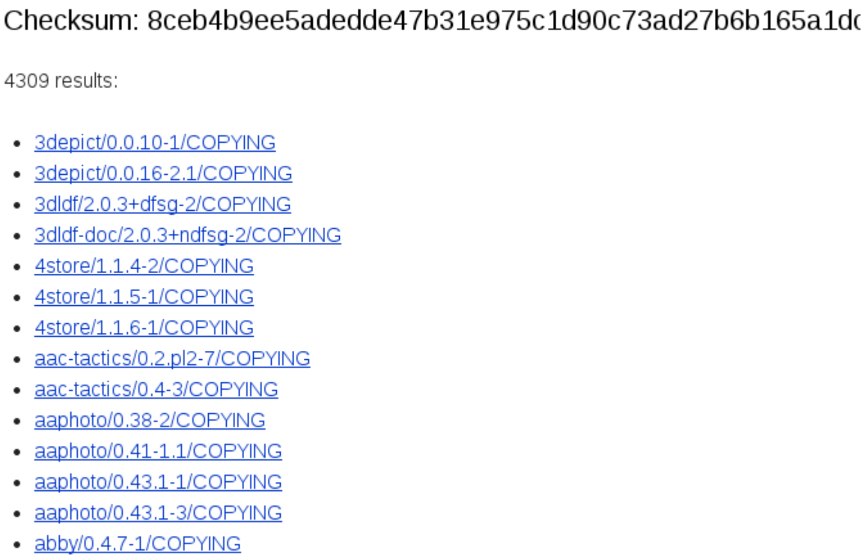
File: COPYING

file content (674 lines) | stat: -rw-r--r-- 35,147 bytes    parent folder | download | duplicates (4309)

package info (click to toggle)

```
                    GNU GENERAL PUBLIC LICENSE
                       Version 3, 29 June 2007

```

# Duplicated files



Checksum: 8ceb4b9ee5adedde47b31e975c1d90c73ad27b6b165a1d

4309 results:

- 3depict/0.0.10-1/COPYING
- 3depict/0.0.16-2.1/COPYING
- 3dldf/2.0.3+dfsg-2/COPYING
- 3dldf-doc/2.0.3+ndfsg-2/COPYING
- 4store/1.1.4-2/COPYING
- 4store/1.1.5-1/COPYING
- 4store/1.1.6-1/COPYING
- aac-tactics/0.2.pl2-7/COPYING
- aac-tactics/0.4-3/COPYING
- aaphoto/0.38-2/COPYING
- aaphoto/0.41-1.1/COPYING
- aaphoto/0.43.1-1/COPYING
- aaphoto/0.43.1-3/COPYING
- abby/0.4.7-1/COPYING

# Integration in the ecosystem

## Codesearch

`http://codesearch.debian.net` is used for regular expression searches, and redirects its results back to Debsources.
Credits: Michael Stapelberg

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## Package tracking systems

The old (`http://packages.qa.debian.org`) and new (`http://tracker.debian.org`) PTS provide links to Debsources ("browse source code").
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## Need to embed code somewhere?

<iframe>s embedding of files content is supported (see documentation).

# Statistics

- Code source metrics for every package.
- Plugins: size, ctags, sloccount

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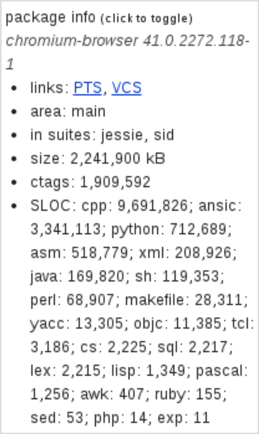


package info (click to toggle)

*chromium-browser 41.0.2272.118-1*

- links: PTS, VCS
- area: main
- in suites: jessie, sid
- size: 2,241,900 kB
- ctags: 1,909,592
- SLOC: cpp: 9,691,826; ansic: 3,341,113; python: 712,689; asm: 518,779; xml: 208,926; java: 169,820; sh: 119,353; perl: 68,907; makefile: 28,311; yacc: 13,305; objc: 11,385; tcl: 3,186; cs: 2,225; sql: 2,217; lex: 2,215; lisp: 1,349; pascal: 1,256; awk: 407; ruby: 155; sed: 53; php: 14; exp: 11

# Statistics

Aggregated statistics are available at `http://sources.debian.net/stats/`.

## Metrics

- Disk usage
- SLOC (source lines of code)
- Number of source packages
- Number of files
- Number of ctags (symbols)

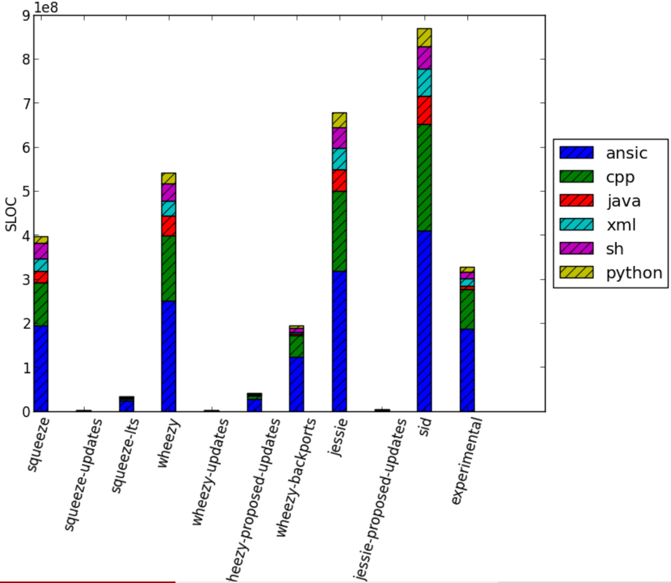
# Statistics

Currently in the *unstable* suite:

| | |
|---|---|
| Disk usage | $\simeq$ 210 GB |
| SLOC (source lines of code) | 1,002,329,283 |
| Number of source packages | 22,763 |
| Number of files | 10,565,532 |
| Number of ctags (symbols) | 114,732,392 |

# Statistics

## Fancy graphs



# API

Along the graphical web interface, an API provides the same functionalities.

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## Examples

```
curl http://sources.debian.net/api/ping/
{ ‘‘status’’: ‘‘ok’’,
  ‘‘http_status_code’’: 200,
  ‘‘last_update’’: ‘‘Fri, 10 Apr 2015 10:16:31 -0000’’ }

curl http://s.d.n/api/info/package/cowsay/3.03-3/
{
‘‘pkg_infos’’: {
   ‘‘suites’’: [
     ‘‘woody’’
...
```

Documentation at `http://sources.debian.net/doc/api/`.

# What's new?

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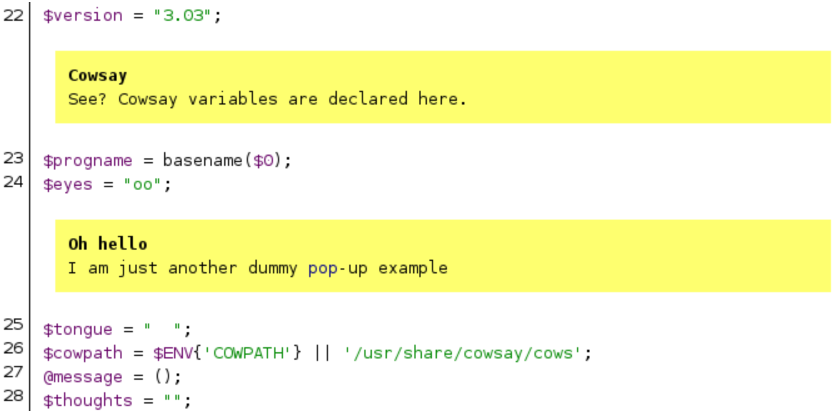
- Many new features since DebConf14
- OPW student: Jingjie Jiang (sophiejjj)
- Many new contributors:
  - Stefano Zacchiroli: 688
  - Matthieu Caneill: 455
  - sophiejjj: 58
  - Orestis Ioannou: 10
  - Jason Pleau: 10
  - Akshita Jha: 7
  - Clément Schreiner: 6
  - Jingjie Jiang: 5
  - Luciano Bello: 1
  - Paul Wise: 1
  - tessy joseph: 1
  - Christophe Siraut: 1
  - sodamatt: 1
  - Tapasweni Pathak: 1

# What's new?

## Multiple pop-up messages

Credits: Orestis Ioannou and Jason Pleau.



```
$version = "3.03";
```

**Cowsay**
See? Cowsay variables are declared here.

```
$progname = basename($0);
$eyes = "oo";
```

**Oh hello**
I am just another dummy pop-up example

```
$tongue = "  ";
$cowpath = $ENV{'COWPATH'} || '/usr/share/cowsay/cows';
@message = ();
$thoughts = "";
```

# What's new?

## Blueprints support

Credits: Jingjie Jiang

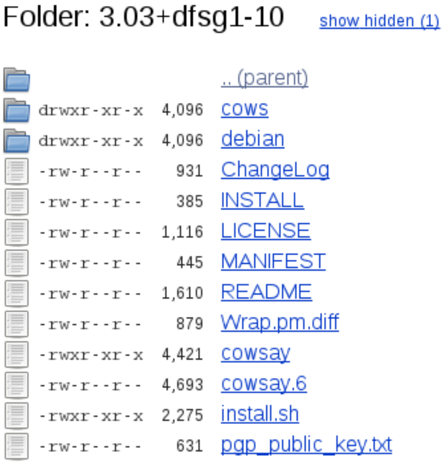
### Blueprints

- Flask apps embedded and plugged together
- Implied a big refactoring
- New features incoming

# What's new?

## Detailed directory listing

Credits: Jingjie Jiang



Folder: 3.03+dfsg1-10 show hidden (1)

```
                   .. (parent)
drwxr-xr-x  4,096  cows
drwxr-xr-x  4,096  debian
-rw-r--r--    931  ChangeLog
-rw-r--r--    385  INSTALL
-rw-r--r--  1,116  LICENSE
-rw-r--r--    445  MANIFEST
-rw-r--r--  1,610  README
-rw-r--r--    879  Wrap.pm.diff
-rwxr-xr-x  4,421  cowsay
-rw-r--r--  4,693  cowsay.6
-rwxr-xr-x  2,275  install.sh
-rw-r--r--    631  pgp_public_key.txt
```

# What's new?

## File edition in-browser

Credits: Raphael Geissert

### File edition

A plugin for Iceweasel and Chromium enables the edition of files in your browser.

A patch ready-to-be-sent$^{TM}$ is generated!

# What's new?

## And many many other features...

- Refactoring

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- Better statistics charts (Orestis Ioannou)
- Python3 support (Zack)

# Roadmap

## Static analysis

- Automatic runs of static analysis tools (e.g. clang, coccinelle) on all Debian packages
- Statistics gathering on bugs evolution
- → Debile, Firewoes

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- Automatic runs of static analysis tools (e.g. clang, coccinelle) on all Debian packages
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## copyright.debian.net

- Web application
- What is the license of package X? Is it compatible with package Y?
- Licenses searching/browsing
- Statistics gathering

# Roadmap

## And many smaller items

- more live stats

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## And many smaller items

- more live stats
- file name search
- binary package → source package redirection
- tarball-in-tarball support
- 100% test suite coverage
- file-level deduplication
  - **select count**(∗) **from** checksums; → 35'370'653
  - **select count**(**distinct** sha256) **from** checksums; → 15'822'745

⇒ deduplicated core: ≈ 45%

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# Technologies

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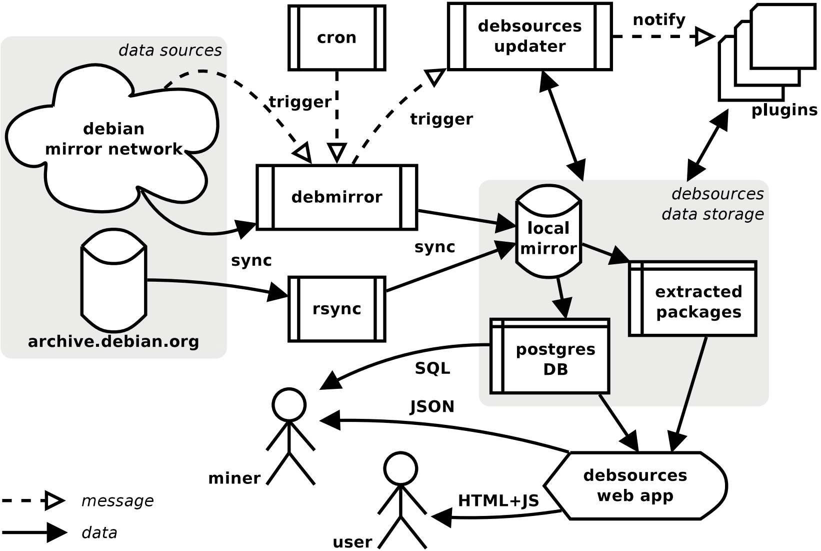
- **Code base**: (almost) entirely in Python
- **Web application**: Flask framework, Jinja2 templates, HTML/CSS/Javascript
- **Database**: PostgreSQL
- Apache web server, SQLAlchemy, ...

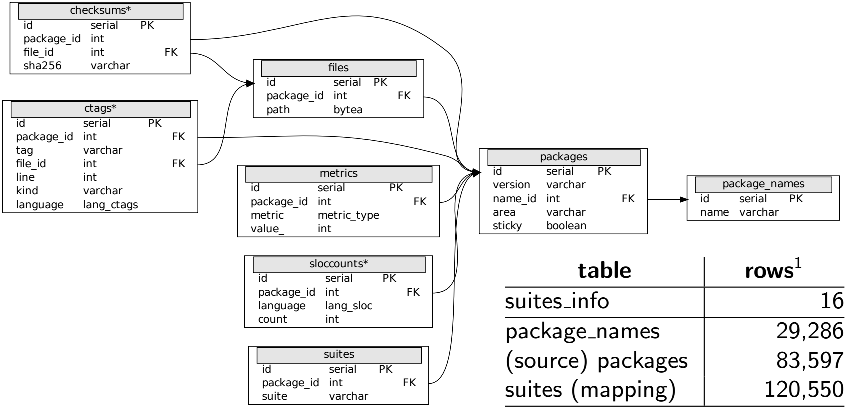
# Overview

## Architecture



# Overview

data model (excerpt)



| checksums* | | |
|---|---|---|
| id | serial | PK |
| package_id | int | |
| file_id | int | FK |
| sha256 | varchar | |

| files | | |
|---|---|---|
| id | serial | PK |
| package_id | int | FK |
| path | bytea | |

| ctags* | | |
|---|---|---|
| id | serial | PK |
| package_id | int | FK |
| tag | varchar | |
| file_id | int | FK |
| line | int | |
| kind | varchar | |
| language | lang_ctags | |

| metrics | | |
|---|---|---|
| id | serial | PK |
| package_id | int | FK |
| metric | metric_type | |
| value_ | int | |

| sloccounts* | | |
|---|---|---|
| id | serial | PK |
| package_id | int | FK |
| language | lang_sloc | |
| count | int | |

| suites | | |
|---|---|---|
| id | serial | PK |
| package_id | int | FK |
| suite | varchar | |

| packages | | |
|---|---|---|
| id | serial | PK |
| version | varchar | |
| name_id | int | FK |
| area | varchar | |
| sticky | boolean | |

| package_names | | |
|---|---|---|
| id | serial | PK |
| name | varchar | |

| table | rows[1] |
|---|---:|
| suites_info | 16 |
| package_names | 29,286 |
| (source) packages | 83,597 |
| suites (mapping) | 120,550 |
| metrics (e.g., du) | 83,597 |
| sloccounts | 298,360 |
| checksums | 35,370,653 |
| ctags | 358,773,259 |

[1] snapshot, 31 July 2014

# Disk usage

| | |
|---|---|
| unpacked sources: | 609 GB |
| PostgreSQL DB: | 111 GB |
| Source mirror: | 71 GB |
| Hosting requirements: | $\approx$ 800 GB |
| | (31 July 2014) |

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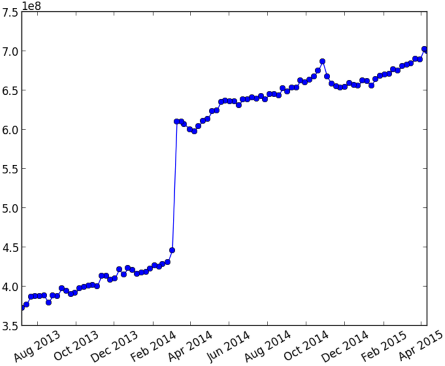

Figure: unpacked sources trend (peek due to `archive.d.o` injection)

# Table of contents

1. Introduction
2. Features
   - Debsources' features
   - What's new?
   - Roadmap
3. Technologies
4. **Research platform**
5. Hacking

# Research platform

## Facts

- Debsources is a huge software collection.
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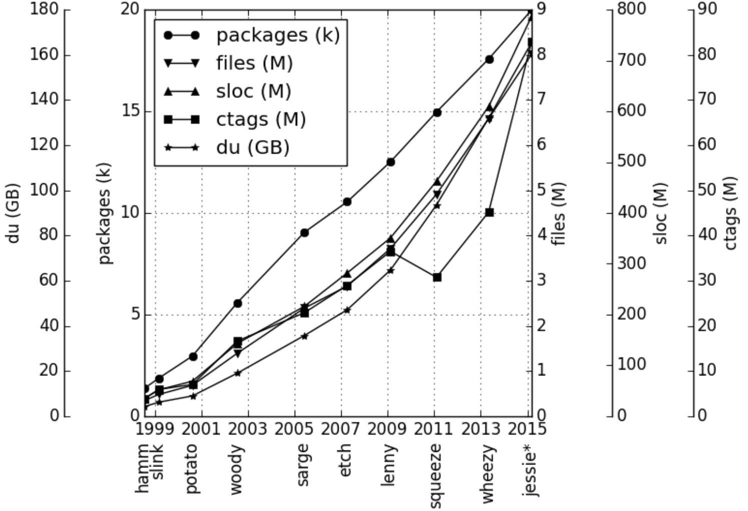
Nice charts can be computed with this!

Example: What are the trending programming languages?

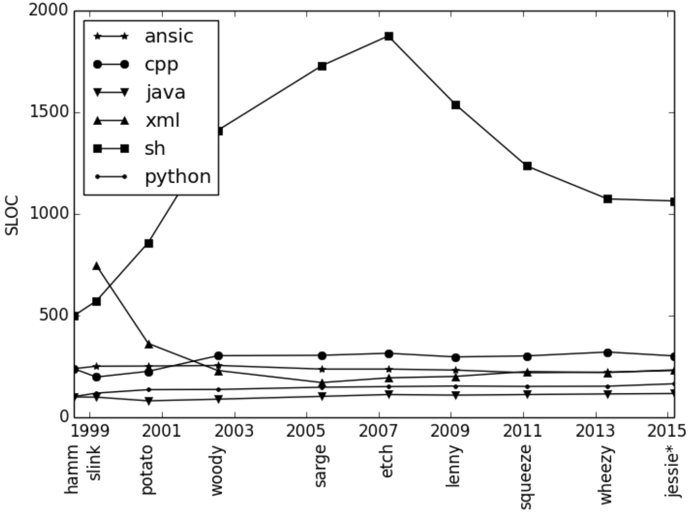
# Research platform

## Software metrics evolution over Debian releases



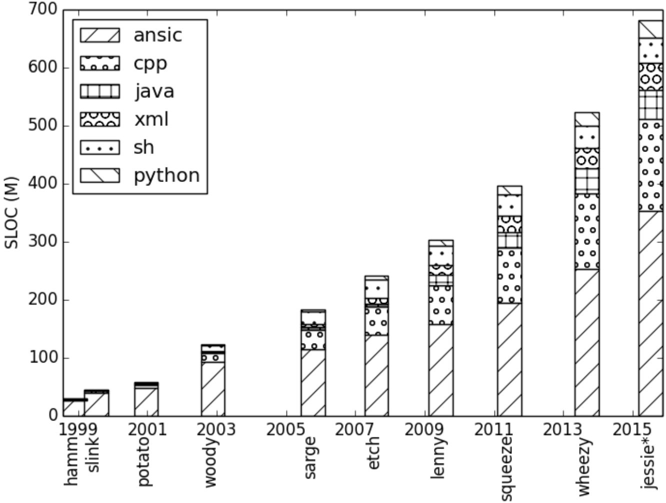
# Research platform

## File size per language, evolution over Debian releases



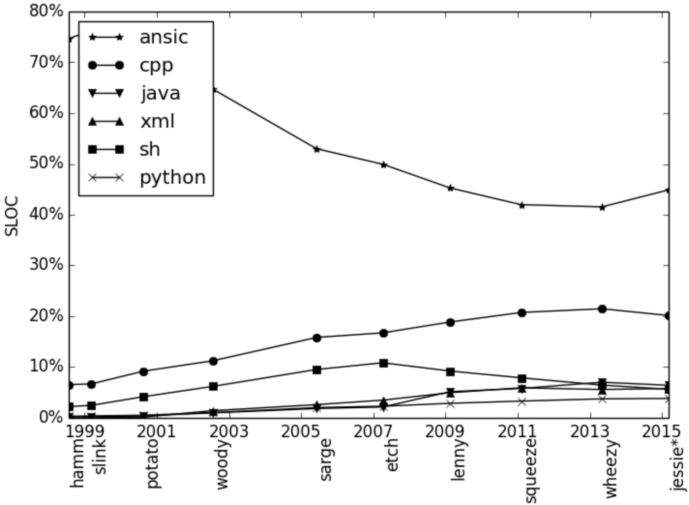
# Research platform

## Absolute evolution of SLOC per language, over Debian releases



# Research platform

## Relative evolution of SLOC per language, over Debian releases



# Research platform

## Publications

- Matthieu Caneill, Stefano Zacchiroli. **Debsources: Live and Historical Views on Macro-Level Software Evolution.** In proceedings of ESEM 2014: 8th International Symposium on Empirical Software Engineering and Measurement.
- Stefano Zacchiroli. **The Debsources Dataset: Two Decades of Debian Source Code Metadata.** To appear in proceedings of MSR 2015: The 12th Working Conference on Mining Software Repositories.

You can find the PDFs of the articles on `http://sources.debian.net/doc/`.

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- Follow the instructions in the HACKING file,
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  Will setup a Docker container with all batteries included: dependencies, database, test data, configuration.

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### Step 3: open your editor and hack!

Bugs list: `https://bugs.debian.org/cgi-bin/pkgreport.cgi?pkg=qa.debian.org;tag=debsources`

or: implement your own plugin (see examples), add features, etc.

# Thanks! Questions?

Matthieu Caneill
http://matthieu.io

Slides: derived from Stefano Zacchiroli
http://upsilon.cc/~zack/talks/2014/20140826-dc14-debsources.pdf

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