Software Heritage: a common infrastructure to preserve our Software Commons

Roberto Di Cosmo
Inria and Université de Paris

19/12/2020, *LibreItalia*

Software Heritage

THE GREAT LIBRARY OF SOURCE CODE

Outline

Short Bio: Roberto Di Cosmo

Computer Science professor in Paris, now working at INRIA

- *30 years* of research (Theor. CS, Programming, Software Engineering, Erdos #: 3)
- *20 years* of Free and Open Source Software
- *10 years* building and directing structures for the common good

1999 *DemoLinux* – first live GNU/Linux distro

2007 *Free Software Thematic Group*
150 members 40 projects 200Me

2008 *Mancoosi project* www.mancoosi.org

2010 *IRILL* www.irill.org

2015 *Software Heritage* at INRIA

2018 *National Committee for Open Science*, France

Software source code: a precious part of our heritage

Harold Abelson, Structure and Interpretation of Computer Programs (1st ed.) 1985

"Programs must be written for people to read, and only incidentally for machines to execute."

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Apollo 11 source code (excerpt)

```
P63SPOT3        CA      BIT6            # IS THE LR ANTENNA IN POSITION 1 YET
                EXTEND
                RAND    CHAN33
                EXTEND
                BZF     P63SPOT4        # BRANCH IF ANTENNA ALREADY IN POSITION 1

                CAF     CODE500         # ASTRONAUT:    PLEASE CRANK THE
                TC      BANKCALL        #               SILLY THING AROUND
                CADR    GOPERF1
                TCF     GOTOPOOH        # TERMINATE
                TCF     P63SPOT3        # PROCEED       SEE IF HE'S LYING

P63SPOT4        TC      BANKCALL        # ENTER         INITIALIZE LANDING RADAR
                CADR    SETPOS1

                TC      POSTJUMP        # OFF TO SEE THE WIZARD ...
                CADR    BURNBABY
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Quake III source code (excerpt)

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float Q_rsqrt( float number )
{
    long i;
    float x2, y;
    const float threehalfs = 1.5F;

    x2 = number * 0.5F;
    y = number;
    i = * ( long * ) &y; // evil floating point bit level hacking
    i = 0x5f3759df - ( i >> 1 ); // what the fuck?
    y = * ( float * ) &i;
    y = y * ( threehalfs - ( x2 * y * y ) ); // 1st iteration
// y = y * ( threehalfs - ( x2 * y * y ) ); // 2nd iteration, this
can be removed

    return y;
}
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Len Shustek, Computer History Museum

"Source code provides a view into the mind of the designer."

Software Commons, Open Science

Definition (Commons)

The commons is the cultural and natural resources accessible to all members of a society, including natural materials such as air, water, and a habitable earth. These resources are held in common, not owned privately. https://en.wikipedia.org/wiki/Commons

Definition (Software Commons)

The software commons consists of all computer software which is available at little or no cost and which can be altered and reused with few restrictions. Thus *all open source software and all free software are part of the [software] commons.* [...]

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Source code: part of our commons ... pillar of Open Science! *(would require another talk)*

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Precious, endangered *executable* and *human readable* knowledge

key people passing away, platforms (GoogleCode, Gitorious, etc.) closing down ...

Outline

Software Heritage

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Collect, preserve and share *all* software source code

Preserving our heritage, enabling better software and better science for all

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find and reference all software source code

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find and reference all software source code

Universal archive

preserve all software source code

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find and reference all software source code

Universal archive

preserve all software source code

Research infrastructure

enable analysis of all software source code


Cultural Heritage
Industry
Research
Education
Software Heritage

Largest software archive, principled

http://bit.ly/swhpaper

Cultural Heritage | Industry | Research | Education

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Software Heritage

Technology

- transparency and FOSS
- replicas all the way down

Content (billions!)

- intrinsic identifiers
- facts and provenance

Organization

- non-profit
- multi-stakeholder

A dedicated core team

Outline

A walkthrough

- Browse the archive
- Get and use SWHIDs (full specification available online)
- cite software with the biblatex-software style from CTAN
- Example use in a research article: compare Fig. 1 and conclusions
  - in the 2012 version
  - in the updated version using SWHIDs and Software Heritage
- Example use in a research article: extensive use of SWHIDs in a replication experiment
- Trigger archival of your preferred software in a breeze
- curated deposit in SWH via HAL, see for example: LinBox, SLALOM, Givaro, NS2DDV, SumGra, Coq proof, ...
- rescue landmark legacy software, see the SWHAP process with UNESCO

Outline

An international, non profit initiative...

Sharing the vision

United Nations
Educational, Scientific and
Cultural Organization

And many more ...
www.softwareheritage.org/support/testimonials

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Donors, members, sponsors

Platinum sponsors

Gold sponsors

Silver sponsors

Bronze sponsors

… creating a mirror network …

Thomas Jefferson, February 18, 1791

…let us save what remains: not by vaults and locks which fence them from the public eye and use in consigning them to the waste of time, but by such a multiplication of copies, as shall place them beyond the reach of accident.

… creating a mirror network …

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Welcoming ENEA

Italian National Agency for New Technologies, Energy and Sustainable Economic Development

- first institutional mirror
- increased resilience
- infrastructure for researchers
- stepping stone to an international joint effort

… raising awareness about Software Source Code

Experts call for greater recognition of software source code as heritage for sustainable development

.6 November 2018

UNESCO, Inria, Software Heritage invite

40 international experts meet in Paris …

… raising awareness about Software Source Code

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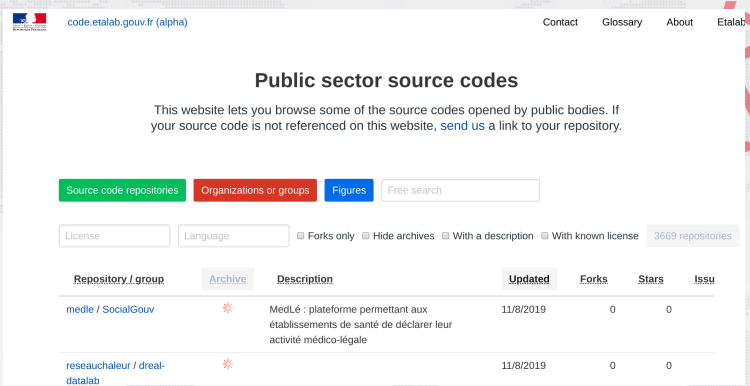
It's an important *policy tool*, already referenced and used … *yes, you can sign it!*

https://en.unesco.org/foss/paris-call-software-source-code

News : archiving *public* code



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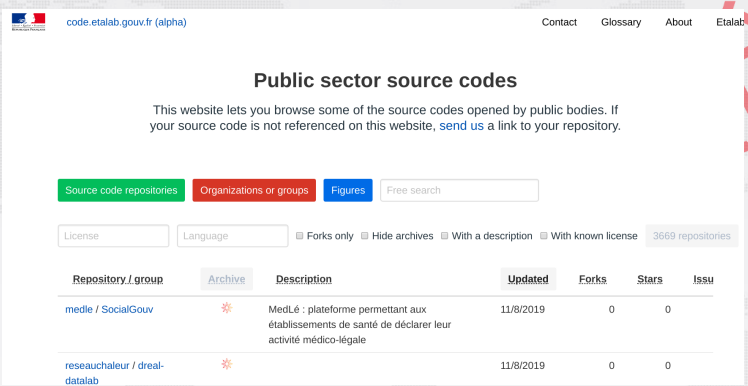
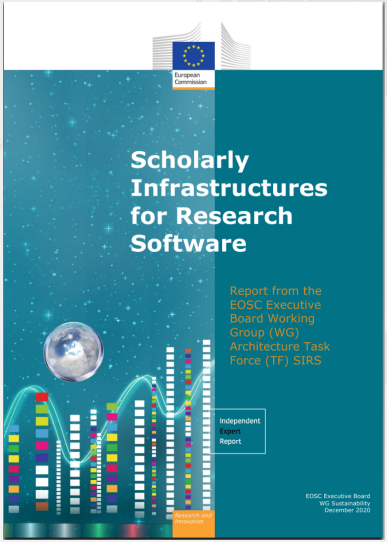


https://code.etalab.gouv.fr

Breaking news: the EOSC SIRS report



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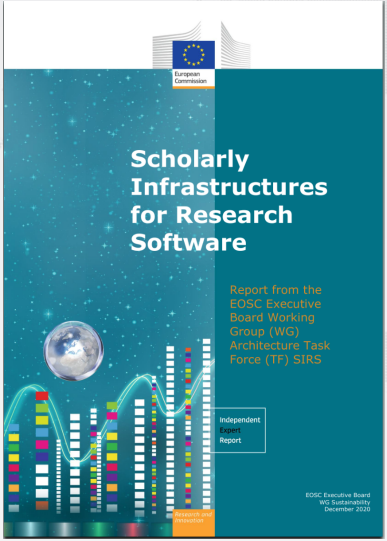

Important *policy tool* in Open Science (Dec 2020)

- 9 infrastructures
  - 3 archives
  - 3 open access publishers
  - 3 aggregators
- recommendations
  - archive in Software Heritage, use SWHID
  - open non profit
  - default to open source for research software

"all research software should be made available under an Open Source license by default, and all deviations from this default practice should be properly motivated"

See https://doi.org/10.2777/28598

Outline

It's urgent to expand the archive

Saving 250.000 endangered repositories...

- summer 2019: BitBucket announce Mercurial VCS phase out
- fall 2019: Software Heritage teams up with Octobus (funded by NLNet, thanks!)
- july 2020: BitBucket erases *250.000* repositories
- august 2020: bitbucket-archive.softwareheritage.org is live

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… preserving the web of knowledge (Tweet is here)

Bottomline

explicit deposit is important, …

… and we must promote it…

… but will never be enough.

(think also of all software dependencies!)

So much to do, so many ways to get involved

Development (selected examples):

develop new *listers* and *loaders*

- apply for a Sloan funded minigrant
  `http://bit.ly/swhgrants` (rolling basis)

rescue and archive landmark legacy software

- use the SWHAP process
  `https://www.softwareheritage.org/swhap`

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Policy, advocacy (selected examples):

promote Software Heritage in (inter)national policy (AgID, EU, OGP, etc.)

adopt Software Heritage (article, journals, public administration, etc.)

advocate spread the word, make Software Heritage all over the world

Software Heritage

www.softwareheritage.org @swheritage

Everybody is concerned, everybody can help build

The Library of Alexandria of code

- recover the past
- structure the future

A CERN for Software

- build better software
  - for industry
  - for society as a whole