News on Open Source from Open Science

building bridges between commons

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LLW

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

2021 *EOSC Task Force on Infrastructures for Software*, European Union

Outline

Why Open Science?

Open Science (Second National Plan for Open Science, France, 2021)

Unhindered dissemination of results, methods and products from scientific research.
It draws on *the opportunity provided by recent digital progress* to develop *open access* to *publications* and – as much as possible – *data*, *source code* and *research methods*.

Jean-Eric Paquet (EU DGRI, on the objective of Open Science)

"Increase *scientific quality*, the *pace of discovery and technological development*, as well as *societal trust in science*."

Mariya Gabriel (EU Commissionneer for Research)

The COVID-19 crisis has also shown that cooperation at international level in research and innovation is more important than ever, including through *open access to data and results. No nation, no country can tackle any of these global challenges alone.*

Yuval Noah Harari (on COVID 19)

"The real antidote [to epidemic] is scientific knowledge *and* global cooperation."

Two well known pillars of Open Science

Open Access (a long, painful, unfinished story)

- 19XX's compulsory exclusive copyright transfer to publishers (unlawful?) (notable exceptions: US federal agencies and UK Crown Copyright)
- 1990's Internet, Web and ArXiv break the marriage of convenience of researchers with publishers
- 2000's declarations (Budapest, 2001; Berlin 7, 2009) and actions (LIPIcs, 2009)
- 2010's reactions (SciHub, 2011; Plan S, 2018) and transformations (not so easy)

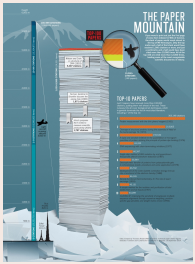
TL;DR: see my viewpoint in 2005 and the SIGPLAN blog in 2020

Open Data (a less painful story, but with many variations)

- 1957-1958: International Geophysical Year shows the way
- 2006 (and 2021): OECD recommendation on publicly funded research data
- 2016 and later: FAIR terminology (*focus on metadata, sort of forgets open…*)

Software: long overlooked pillar of Open Science

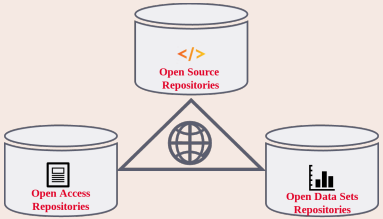
Software powers modern research



[…] software […] essential in their fields.
Top 100 papers (Nature, 2014)

Sometimes, if you dont have the software, you dont have the data
Christine Borgman, Paris, 2018

Missing pillar: software (source code)



The links in the picture are important

Nota Bene

software may be a *tool*, a *research outcome* and a *research object*

access to the *source code* is essential!

Preserving (the history of) source code is necessary for *reproducibility*

Software *Source Code* is Precious Knowledge

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."

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
```

Quake III source code (excerpt)

```
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;
}
```

Len Shustek, Computer History Museum 2006

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

The Paris Call on Software Source code (2019, UNESCO)

UNESCO, Inria, Software Heritage invite
40 international experts to meet in Paris

The call is published on Feb 2019

"[We call to] promote software development as a valuable research activity, and research software as a key enabler for Open Science/Open Research, sharing good practices and recognising in the careers of academics their contributions to high quality software development, in all their forms"
https://en.unesco.org/foss/paris-call-software-source-code

Outline

Selected concerns

Policy for dissemination and reuse

- make research software *open source*
- revisit technology transfer and industry collaboration

Sustainability

technical improve quality of *key* research software

financial make research software as easy to fund as buying a license

Infrastructures, technologies and tools (selection)

preservation avoid loss of source code (e.g. Google Code, Gitorious, etc.)

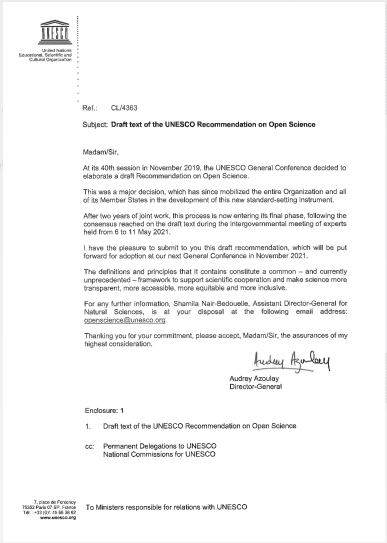
reproducibility adopt intrinsic identifiers (cryptographic hashes like SWHID)

plagiarism detection determine what part of a research project is original

So you see some shared concern?

good news: change is ongoing!

The UNESCO recommendations for Open Science, 2018-2021



United Nations Educational, Scientific and Cultural Organization

Ref.: CL/4363

Subject: **Draft text of the UNESCO Recommendation on Open Science**

Madam/Sir,

At its 40th session in November 2019, the UNESCO General Conference decided to elaborate a draft Recommendation on Open Science.

This was a major decision, which has since mobilized the entire Organization and all of its Member States in the development of this new standard-setting instrument.

After two years of joint work, this process is now entering its final phase, following the consensus reached on the draft text during the intergovernmental meeting of experts held from 6 to 11 May 2021.

I have the pleasure to submit to you this draft recommendation, which will be put forward for adoption at our next General Conference in November 2021.

The definitions and principles that it contains constitute a common – and currently unprecedented – framework to support scientific cooperation and make science more transparent, more accessible, more equitable and more inclusive.

For any further information, Shamila Nair-Bedouelle, Assistant Director-General for Natural Sciences, is at your disposal at the following email address: openscience@unesco.org.

Thanking you for your commitment, please accept, Madam/Sir, the assurances of my highest consideration.

Audrey Azoulay
Director-General

Enclosure: 1

1. Draft text of the UNESCO Recommendation on Open Science

cc: Permanent Delegations to UNESCO
National Commissions for UNESCO

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To Ministers responsible for relations with UNESCO

Selection from the recommendations

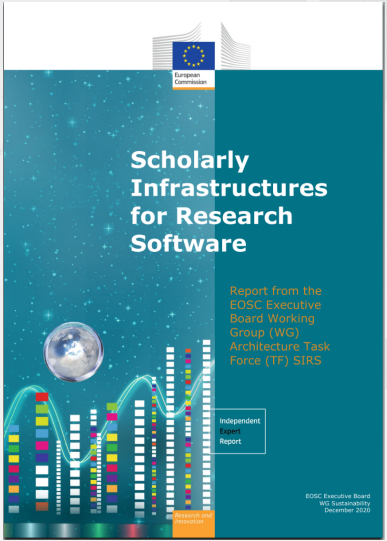
- Open Source for Open Science

  "The source code must be included in the software release and made available on openly accessible repositories and the chosen license must allow modifications, derivative works and sharing under equal or compatible open terms and conditions"

- Infrastructures

  "Open science infrastructures should be organized and financed upon an essentially not-for-profit and long-term vision, which enhance open science practices and guarantee permanent and unrestricted access to all, to the largest extent possible."

The EOSC SIRS report: Software Source Code and Open Science, 2020



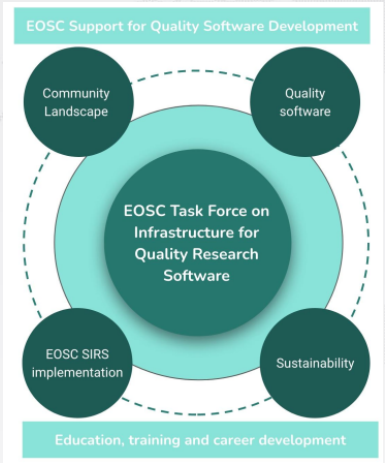
Important *policy tool* in Open Science (Dec 2020)

- 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

Software in the EOSC



Ongoing action in the EOSC

Task force on infrastructures for quality research software

- Foster the development and deployment of tools and services that allow researchers to properly archive, reference, describe with proper metadata, share and reuse research software.
- Improve the quality of research software, both from the technical and organizational point of view …
- Increase recognition to software developers and maintainers of research software …

See the charter of the task force.

French National plan for Open Science, 2021-2024

2nd National Plan for Open Science (6/7/2021)

Open and promote research software source code

- actions (selection)
  - charter for research software policy
  - recognize software development (see announcement of the 2021 prize)
  - coordinate communities of practice
  - connected ecosystem of research outputs
- recommendations (selection)
  - archive in Software Heritage
  - standardise and use SWHID
  - build a national catalog of research software
  - leverage ADAC network

See official announcement

Outline

It's time to engage with policy makers and academia

Questions?

References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French Ministry of Research, *Second National Plan for Open Science*
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CACM, October 2018 (10.1145/3183558)