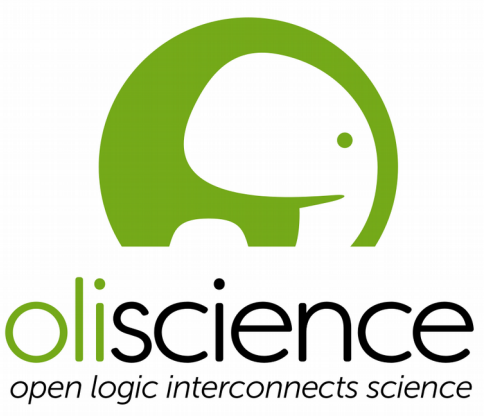




# FPGA as a multidisciplinary tool for scientific research and industry

## *a practical example*

**Andrea Borga**
digital design engineer and co-founder

oliscience
open logic interconnects science

# Outlook

- Oliscience in a nutshell
- Consultancy customers
- Technology challenge forecast
- OpenCores
- OpenCores premium partners
- OpenCores status and plans
- Seeding ideas for better collaboration

# About Oliscience BV

- Originating from the CERN-BIC at Nikhef

Nikhef


- Incubated at Amsterdam Centre for Entrepreneurship
- Based at the Amsterdam Science Park

# Oliscience management team

- Alberto Alberton: (sales and marketing)
  - → experienced entrepreneur
  - → angel investor in oliscience
- Leo Davoli: (legal and operations)
  - → professional lawyer
  - → angel investor in oliscience
- Andrea Borga: (CEO and CTO)
  - → seasoned digital design engineer
  - → passionate technologist
  - → open source enthusiast
  - → the geek!

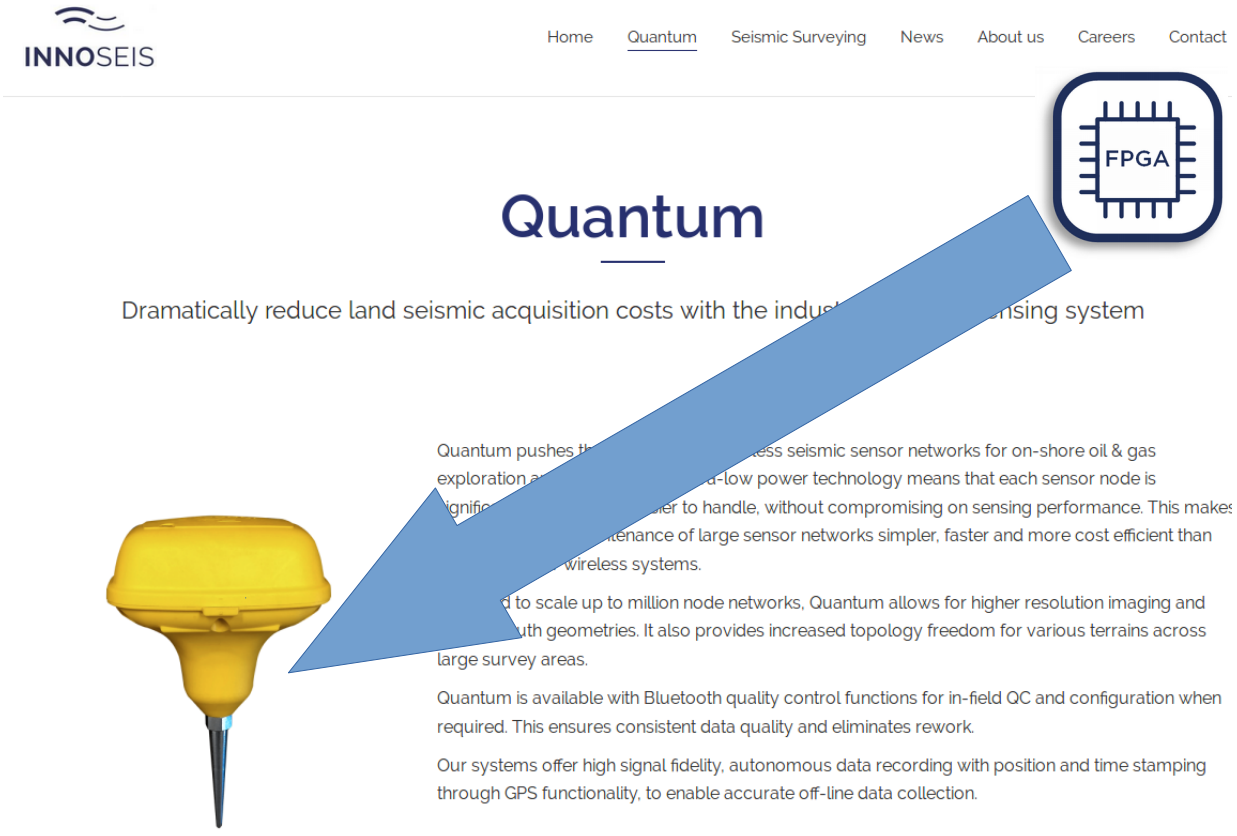
# Oliscience in a nutshell

- Core business: FPGA technology
- Innovating in the field of FPGA
- Providing consultancy services
- Driving the OpenCores.org platform: community portal for the exchange of Free and Open Source IP Cores

# Oliscience consultancy services

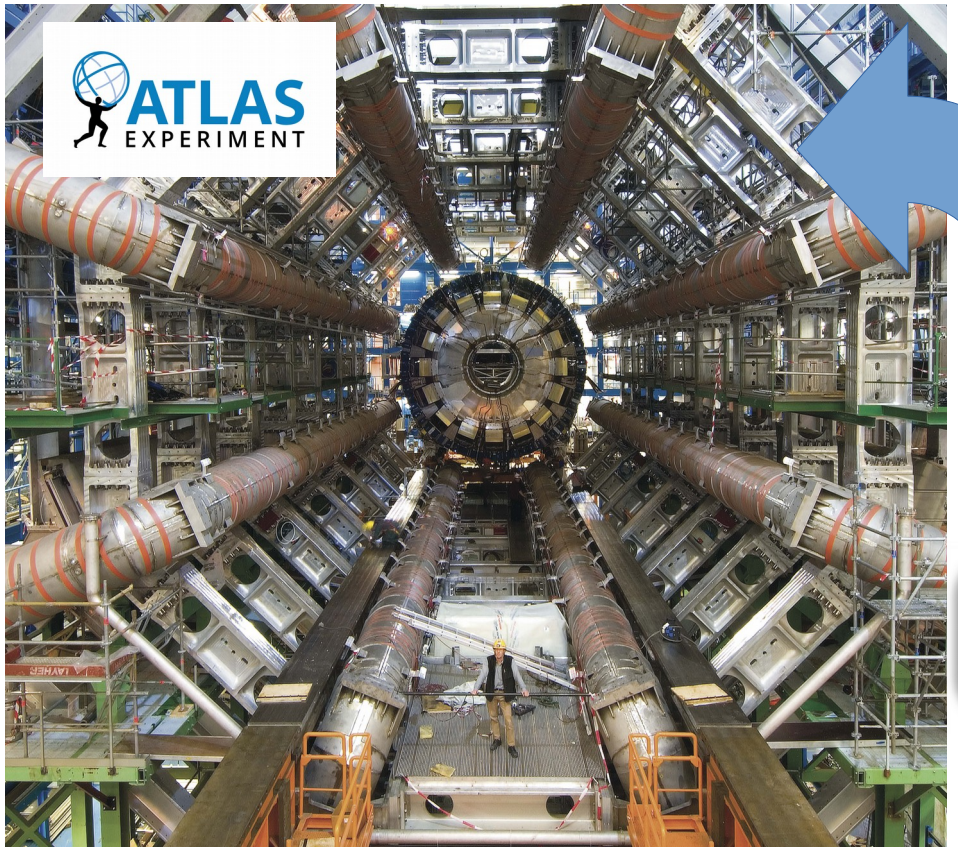
- In our **mission**:
  *"Specialize in the design, streamline, documentation and long term support of gateware Intellectual Property (IP) Cores for FPGA."*
- If digital design is 30% coding + 70% verification and documentation… if anything else we tap into the "remaining" 70!

# Consultancy customer

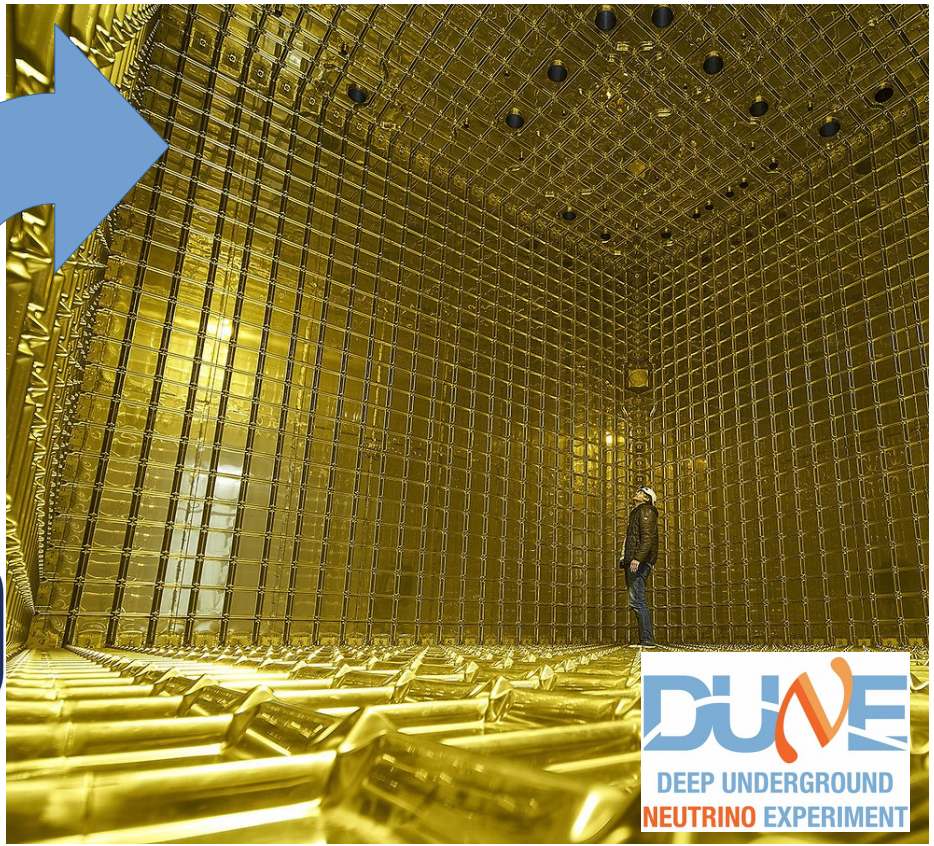



- Nasty bug...
- Analysed
- Advised how to pin point it
- Iterated
- Fixed the problem
- Advised on general design methodology

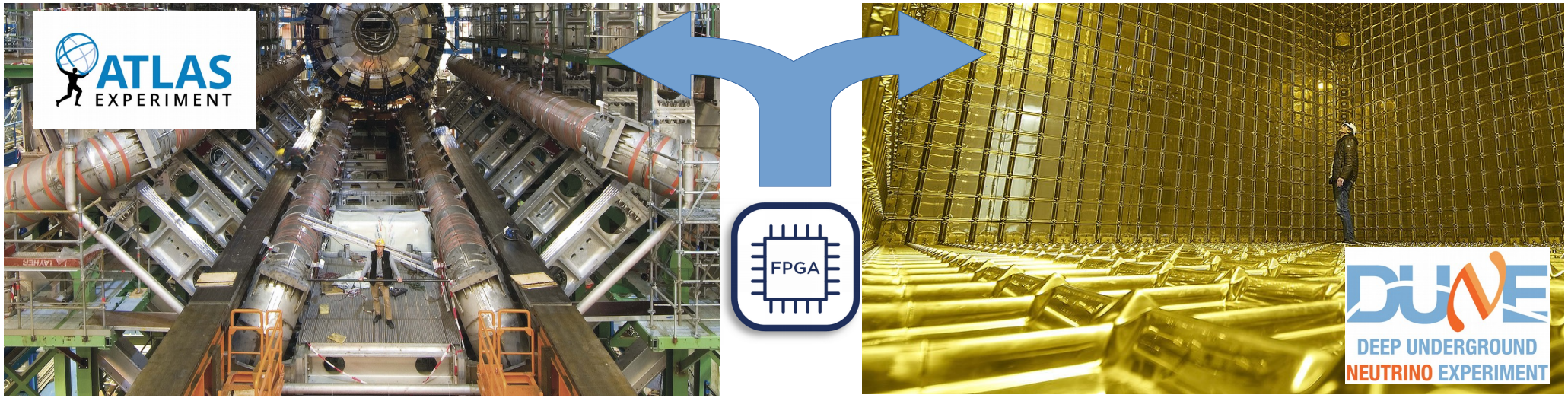
# Consultancy customer




FPGA



# Crossing the valley of death




- **Valorization**… who's willing to take the risk?
- Proper **technology transfer** is *hard* much harder than hardware… sometimes...

# Try this at home?


Toyota Celica ST205 (sixth generation)

# FPGA upcoming challenges (1/3)

- The FPGA world is bustling
  - Nano Xplore → FPGA made EU!
  - Intel PSG → Altera
  - Microchip → Microsemi
  - Canyon Bridge Capital Partners → Lattice
  - Xilinx: The Last of the Mohicans
- The Open Source world is bustling
  - Microsoft → GitHub (7.5 Billions...)
  - IBM → Red Hat (23 Billions…)

# FPGA upcoming challenges (2/3)

- new fields of application are emerging
  - High Performance Computing
  - Hexascale (Heterogeneous) Computing
  - Industry and all the buzz (IoT, AI, ML, ...)
- new design techniques are raising
  - High Level Synthesis vs. OpenCL
  - Python (Migen, MyHDL), Haskell (Clash), P4 (Netcope)
  - Dataflow Engines (Maxeler), Matlab Simulink, ...
- **where to go?**
- **how to get there?**

# FPGA upcoming challenges (3/3)

- complexity is exponentially growing
- **trust in quality of open source products screams for verification**
  → would you put IP Core “xyz” in space?
- **open standard reference design to compare against?**

# SpaceWire anyone?

- Browsing OpenCores only...
- https://opencores.org/projects/spacewire_light
- https://opencores.org/projects/spacewire
- https://opencores.org/projects/socwire

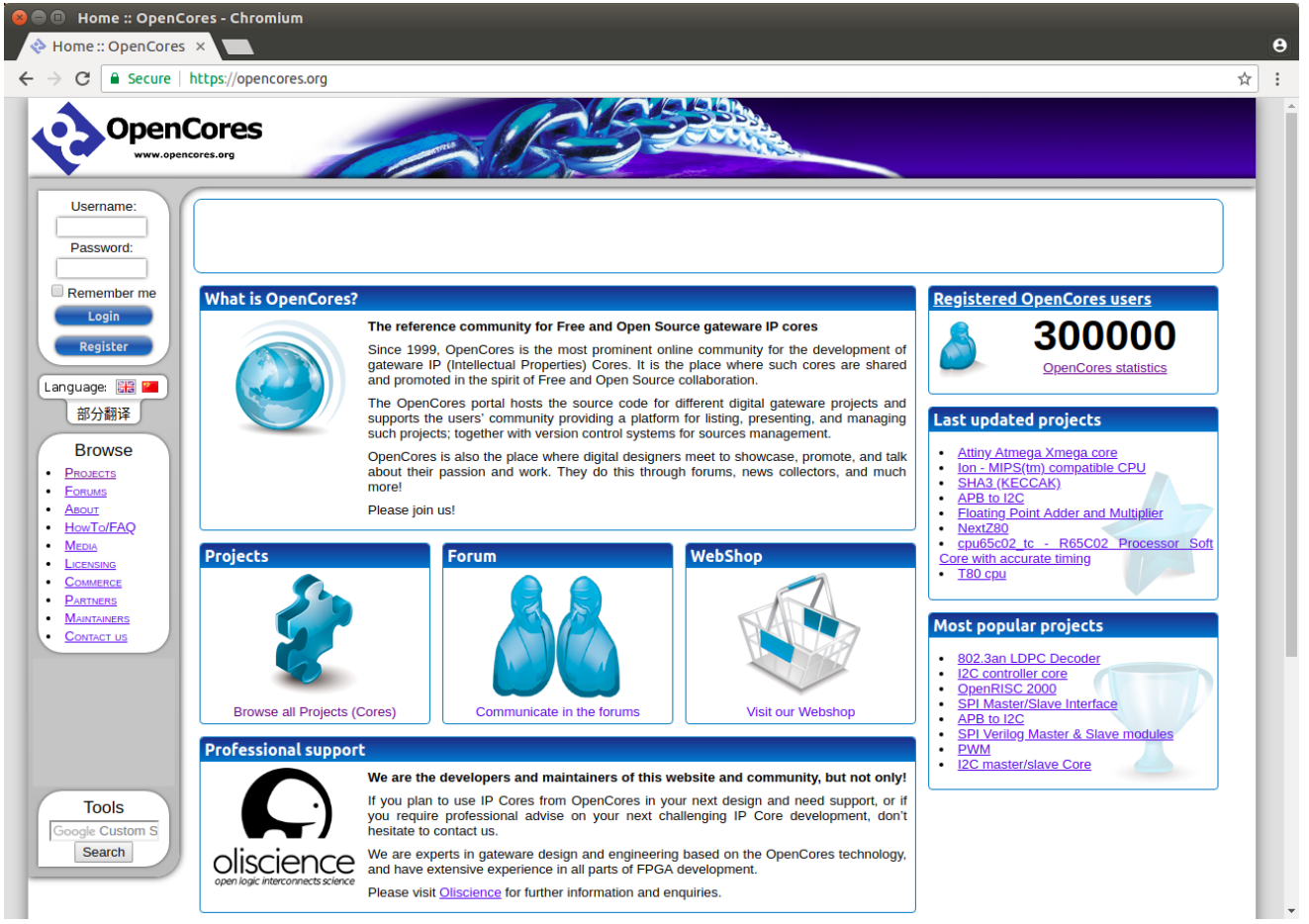
- How many more available “out there”?

# Share is the name game


**Share… why?**

- Get the job done
- Avoid duplication effort
- Seeding of ideas
- Free peer review
- *Sharing in the genes of scientific collaboration*
- A lot of testing done by third parties **(verification)**
- Promote common/good practices **(standardization)**
- Sharing often comes bidirectional

# The “good old” OpenCores.org



# OpenCores.org in numbers

- Made in Europe!
- Funded in 1999
- Frequented by >300.000 professionals
- Generating ~500.000 views per month
- **Acquired by Oliscience in 2017**
- Still strong identity, established trademark, consistent community, very specialized

# OpenCores.org purpose

- OpenCores brings together Digital Design Engineers
- **make FPGA and gateware more accessible**
- **push!** ensure that the best IP Cores are used and let them be improved further by community
- **pull!** encourage more people to add IP Cores

# Oliscience goals

- **Stimulate** the community
- **Offer** an “impact metrics” to asses performance
- **Motivate** designers to contribute
- **Steward** a forum for minds-alike to meet
- **Promote** best-in-class design practices
- **Support** our premium partners actively

# OpenCores → to the next level

- Grow community and increase content
  - → many micro processors architectures
  - → virtually all standard peripherals
  - → a lot of general infrastructure cores
- Increase content **quality and trust**
  - → verification, *verification*, verification!
  - → standardize methodologies and benchmarks
  - → have credited institutions helps the process

**be the reference market place where new ideas are exchanged and advanced**

# A call to action to partners

**<u>we</u> develop, drive and promote the large OpenCores community**

consisting of:

- Research institutions
- Universities
- High-tech corporates

**<u>you</u> access resources on our portal and contribute fostering common practices**

# Premium partner

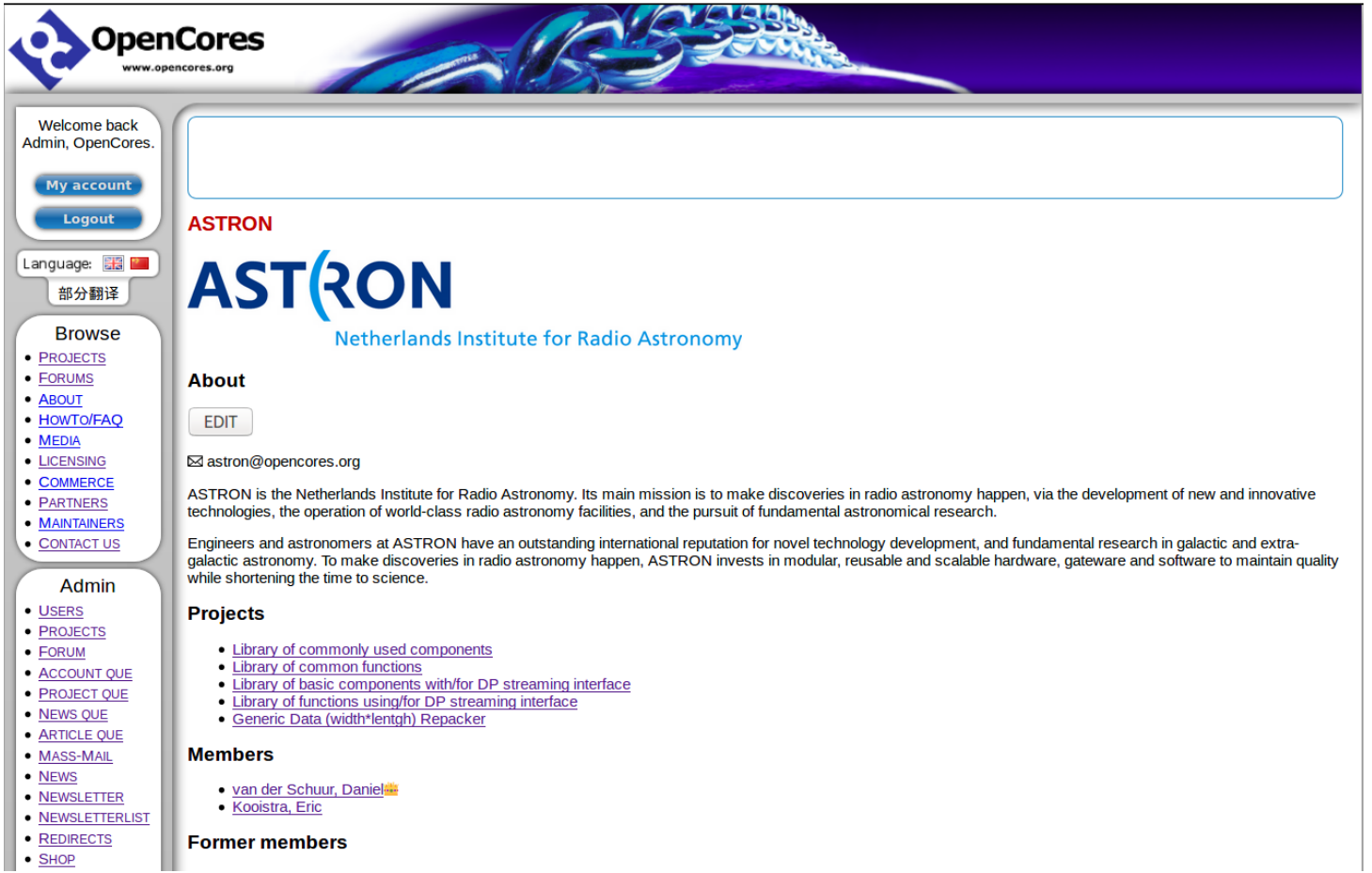
ASTRON
Netherlands Institute for Radio Astronomy

"[…] **We are working on the opposite extremes of physics, but we are using the same technology**. This collaboration allows us to share ideas and reuse FPGA designs, which will help to speed-up the process of engineering the tools for science."- *Daniel Van der Schuur*

# What did we do?

- Prototyped the premium partners section
- Added more prominent display of the affiliated institute on a premium IP Core project
- Created institute@opencores.org alias
- Added a project description parsed from a README.md in the svn repo
- Coded new infrastructure features in nodejs

# Premium partners section



# More prominent presence

## Wupper: PCIe DMA Engine for Xilinx FPGAs :: Overview

Overview | Hardware details | Software details | Doxygen | News | Downloads | Bugtracker

Edit pages | Add a block

Define block order | Help

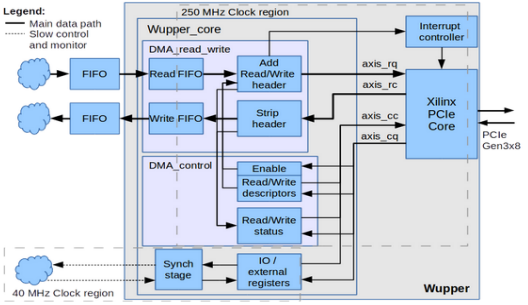

### Details

Name: virtex7_pcie_dma
Created: Dec 18, 2014
Updated: Apr 7, 2018
SVN Updated: Feb 14, 2018
SVN: Browse
Latest version: download (might take a bit to start...)
Statistics: View
Bugs: 7 reported / 6 solved

★ Unstar | 8 you like it: star it!

### Other project properties EDIT

Category:System controller
Language:VHDL
Development status:Mature
Additional info:FPGA proven, Specification done
WishBone compliant: No
WishBone version: n/a
License: LGPL




### Project maintainers

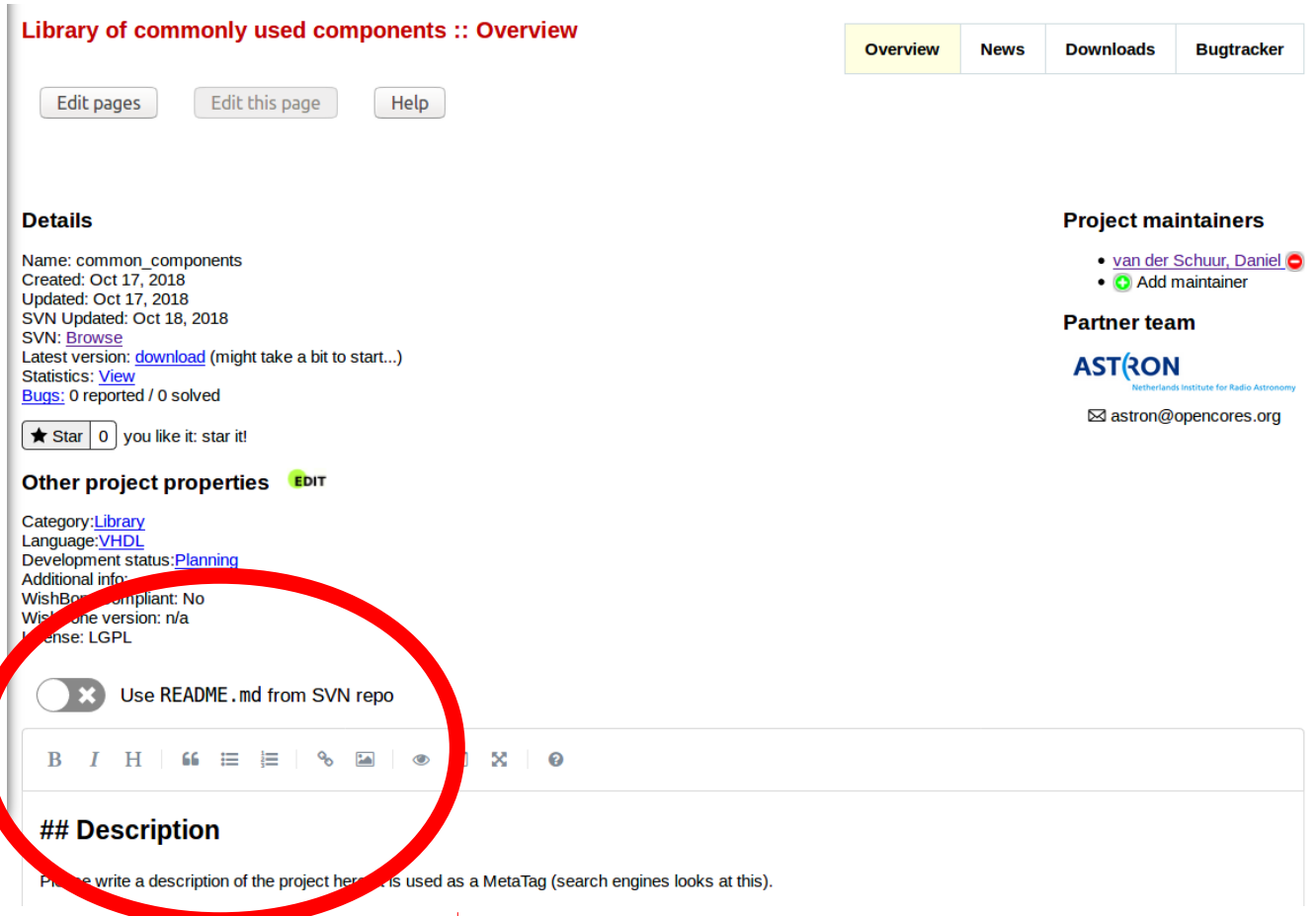
- Borga, Andrea
- Blankers, Roel
- Schreuder, Frans
- Kharraz, Oussa
- Add maintainer

### Partner team

Nikhef

nikhef@opencores.org

# README.md parser



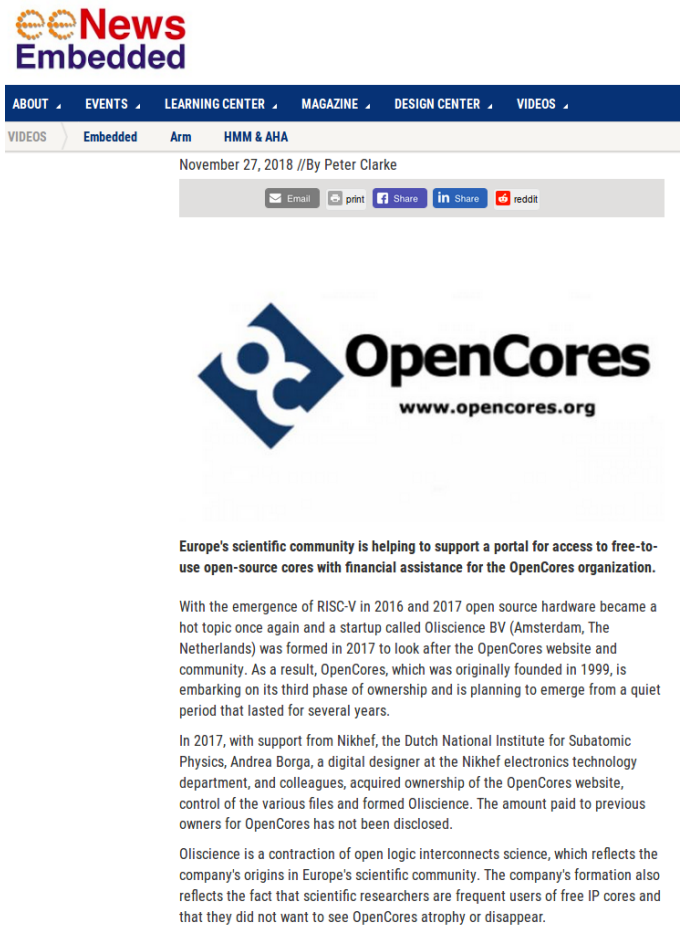
# What did we learn?

- Different labs have different needs, work-flows, processes, organization and cultures
- What is home-made might not be one-to-one ready for the general public
- Strive for simplicity and proper structure
- **Ponder about all the above makes the organization itself potentially better (our view)** → forces all of us to critically self assess

# Plans for this year

- Better **indexing** and **searching** for the Cores
- Look into **GIT support**
- Improve overall interaction and **user experience** on the website
- Evaluate **design challenge** opportunities
- **Marketing** and **community management**

# In the public domain



EE News Embedded

ABOUT | EVENTS | LEARNING CENTER | MAGAZINE | DESIGN CENTER | VIDEOS

VIDEOS | Embedded | Arm | HMM & AHA

November 27, 2018 //By Peter Clarke

Email | print | Share | Share | reddit

OpenCores
www.opencores.org

**Europe's scientific community is helping to support a portal for access to free-to-use open-source cores with financial assistance for the OpenCores organization.**

With the emergence of RISC-V in 2016 and 2017 open source hardware became a hot topic once again and a startup called Oliscience BV (Amsterdam, The Netherlands) was formed in 2017 to look after the OpenCores website and community. As a result, OpenCores, which was originally founded in 1999, is embarking on its third phase of ownership and is planning to emerge from a quiet period that lasted for several years.

In 2017, with support from Nikhef, the Dutch National Institute for Subatomic Physics, Andrea Borga, a digital designer at the Nikhef electronics technology department, and colleagues, acquired ownership of the OpenCores website, control of the various files and formed Oliscience. The amount paid to previous owners for OpenCores has not been disclosed.

Oliscience is a contraction of open logic interconnects science, which reflects the company's origins in Europe's scientific community. The company's formation also reflects the fact that scientific researchers are frequent users of free IP cores and that they did not want to see OpenCores atrophy or disappear.

- Open Cores rides again
- Honoured in OSDA program

**Workshop on Open Source Design Automation (OSDA) 2019**

**held in conjunction with the Design, Automation and Test in Europe Conference (DATE)**
**Friday, March 29, 2019; Florence, Italy**

**Final Programme**

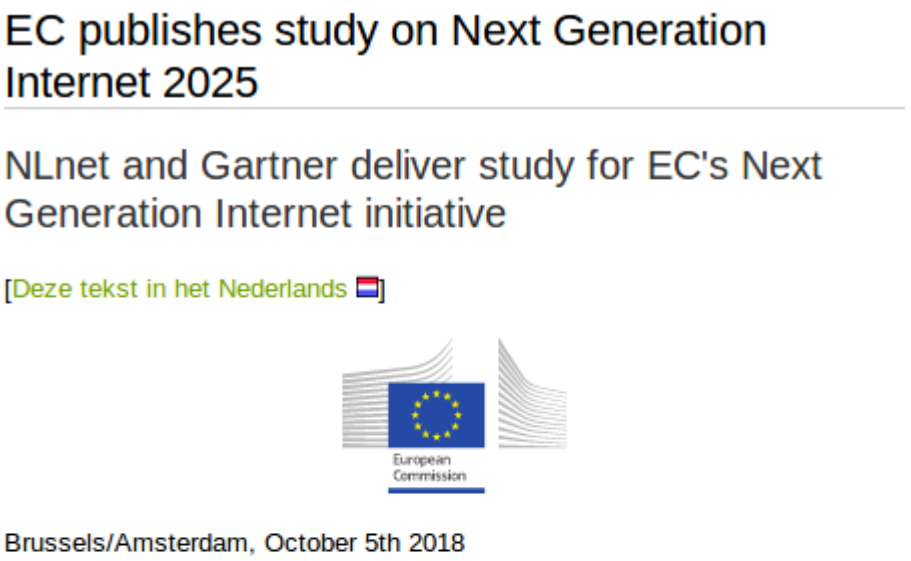
**Registration Link**
**Note: Please select "Friday Workshop W10"**

**Gratefully acknowledge support from our sponsors:**

redhat | Symbiotic EDA | trenz electronic GmbH | OLIMEX

# In the public domain

- Mentioned in a report for the EU Commission…



EC publishes study on Next Generation Internet 2025

NLnet and Gartner deliver study for EC's Next Generation Internet initiative

[Deze tekst in het Nederlands]

European Commission

Brussels/Amsterdam, October 5th 2018

**https://nlnet.nl/news/2018/20181005-NGI-Study-Report-en.html**

# In the public domain

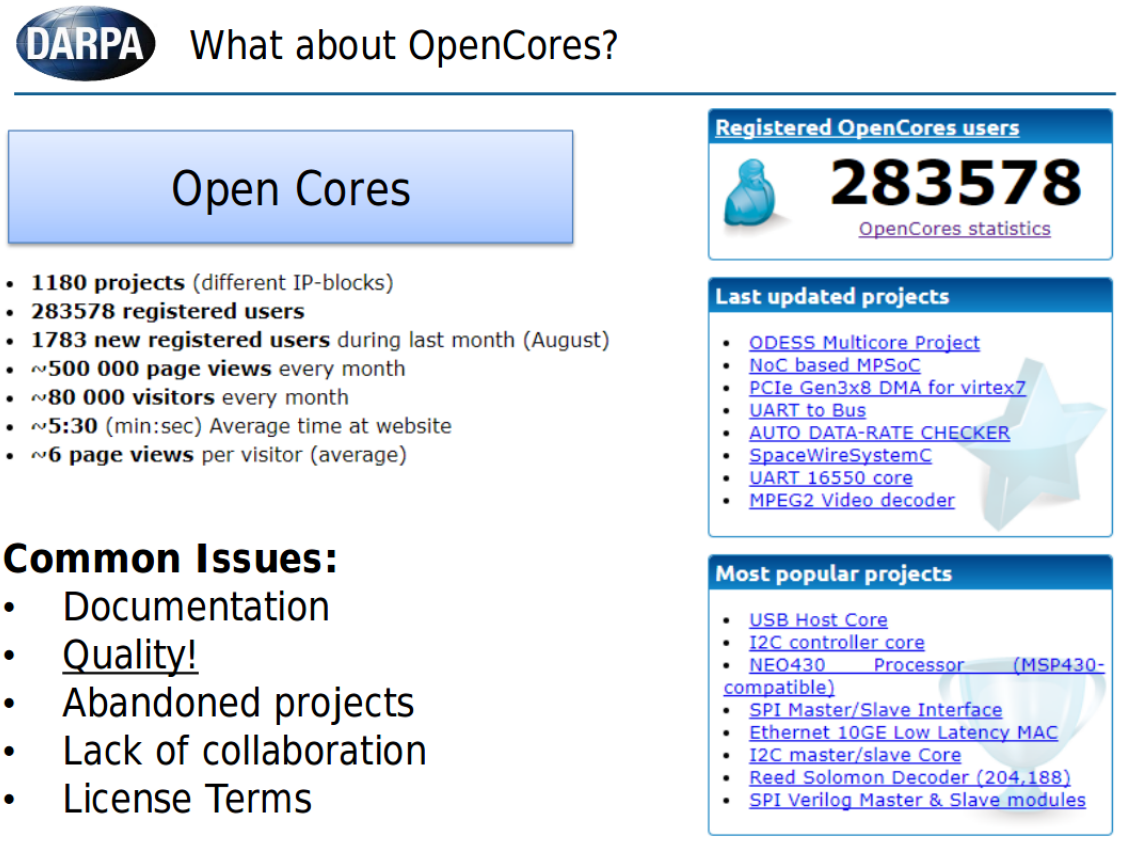
- Mentioned in a report for the European Commission (EC)...

EC publishes study on Next Generation Internet 2025


The European Commission's Directorate-General CNECT has published the much anticipated study "Next Generation Internet 2025", an in-depth analysis of the state of the internet performed by NLnet foundation and Gartner Europe. *"We believe that the Next Generation Internet initiative has actual potential to vastly improve the internet and change the current course of the internet"*, states Michiel Leenaars, director of Strategy at NLnet and leader of the study. *"The strategic topics we have identified in the report are essential to reach those goals"*.

# In the public domain

- … and DARPA (US)




**https://www.darpa.mil/attachments/eri_design_proposers_day.pdf**

# Thank you


+


**www.opencores.org**

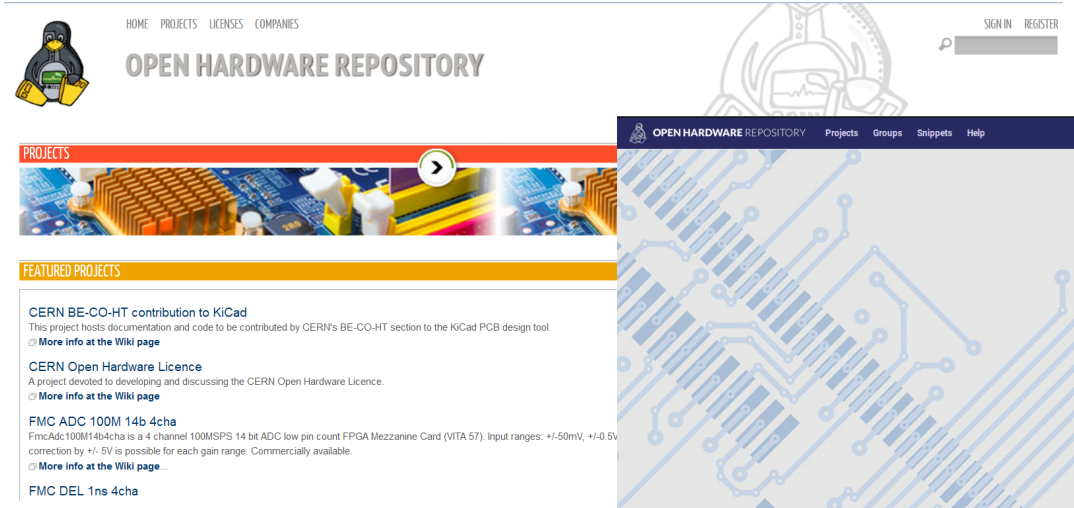
**www.oliscience.nl**

**LinkedIn: https://www.linkedin.com/company/oliscience/**

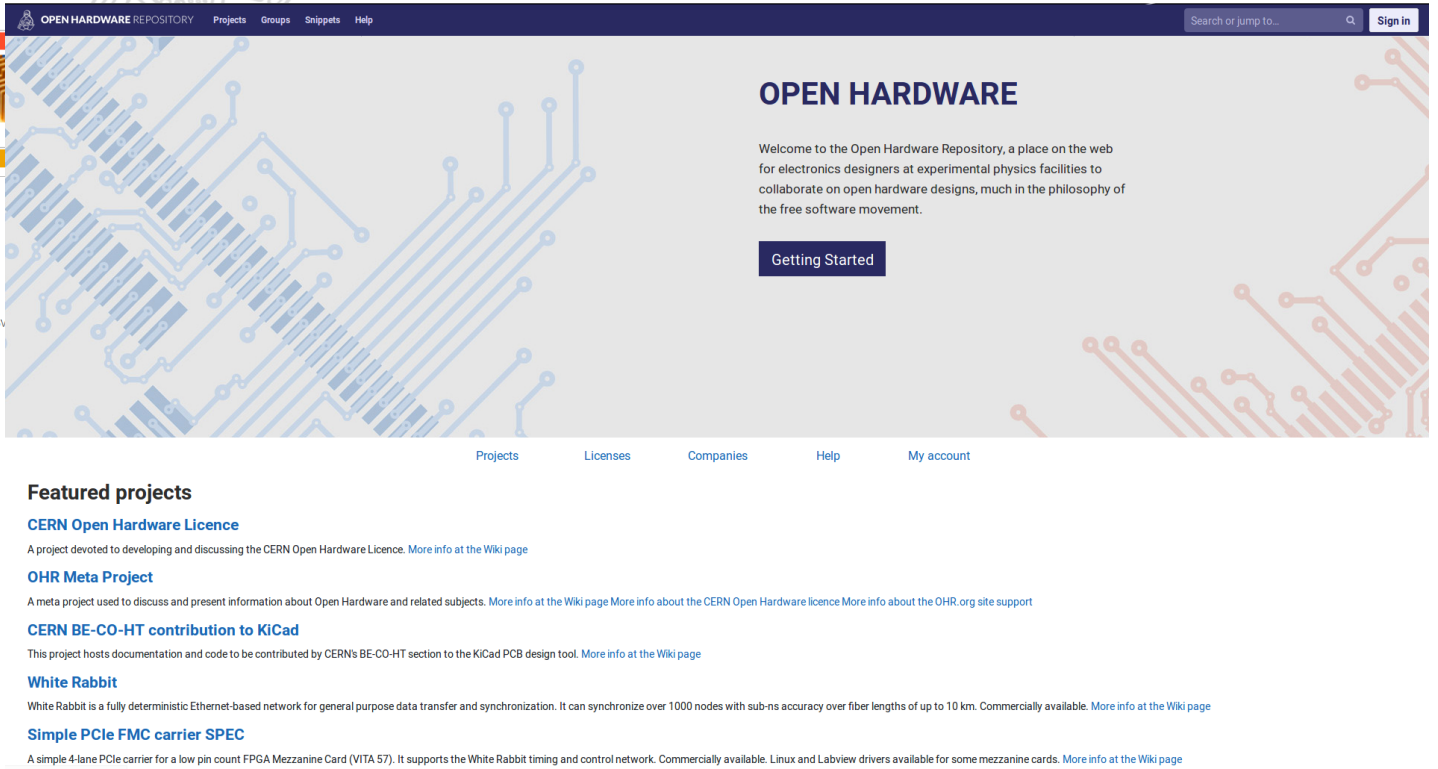
**Twitter: @Oliscience101**

# CERN efforts

# CERN efforts: sharing platform

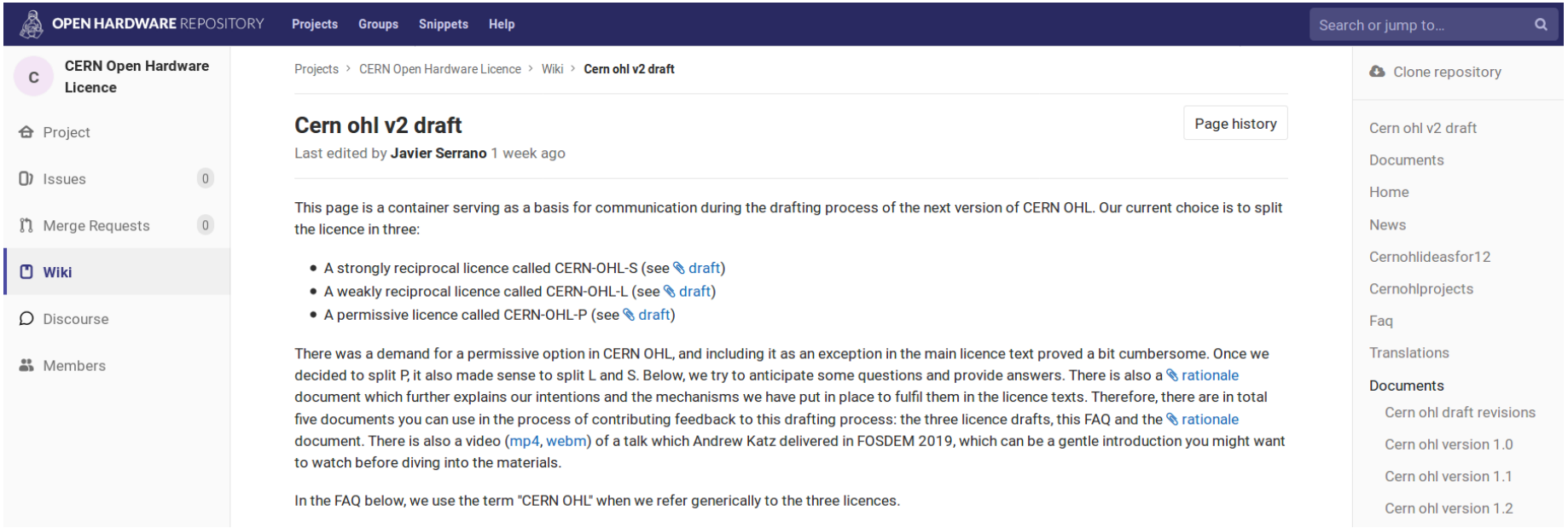



**http://www.ohwr.org**




- Migrated from Redmine to GitLab

# CERN efforts: licensing




**https://www.ohwr.org/projects/cernohl/wiki/cern-ohl-v2-draft**

- New draft version of the Open Hardware Licence (OHL) v2
- Better coverage for “gateware”