

# **FPGA as a multidisciplinary tool for scientific research and industry**

*a practical example*

**Andrea Borga**

digital design engineer and co-founder

- Valorization
- Oliscience in a nutshell
- Consultancy customers
- OpenCores
- OpenCores premium partners

## What is valorisation?

**Valorisation is defined and applied in various ways.**

Policymakers like the VSNU, Rathenau, Advisory Council for Science, Technology and Innovation (AWT), and NWO define 'valorisation' as follows:

**'Valorisation is the process of creating value from knowledge, by making knowledge suitable and available for societal and/or economic application and by transforming it into products, services, processes and new business.'**

[http://www.ix.nl/fileadmin/user\\_upload/Documenten/ValorisatiegidsVU-UvA\\_Web\\_ENG.pdf](http://www.ix.nl/fileadmin/user_upload/Documenten/ValorisatiegidsVU-UvA_Web_ENG.pdf)

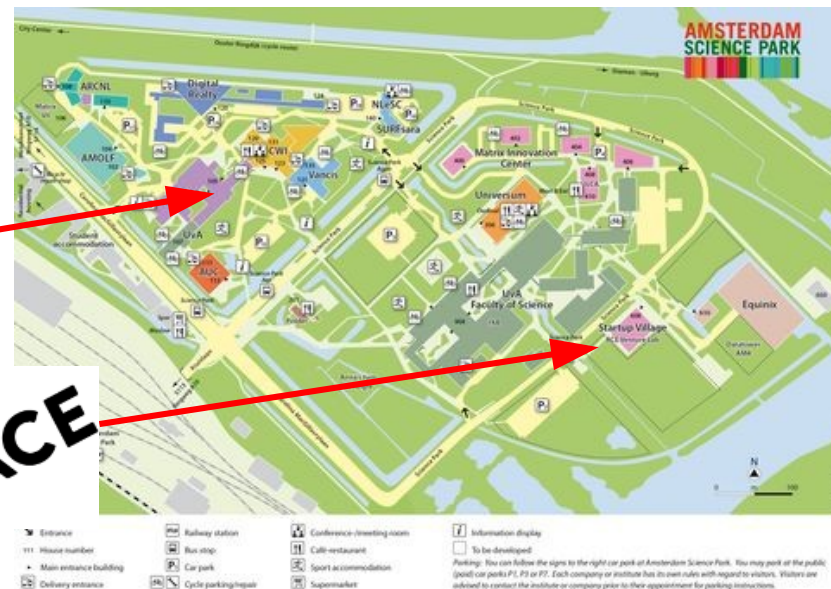
# About Oliscience BV

- 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

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- 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 gateway 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

## Quantum

Dramatically reduce land seismic acquisition costs with the industry's most efficient sensing system



Quantum pushes the boundaries of seismic sensor networks for on-shore oil & gas exploration and production. Its ultra-low power technology means that each sensor node is significantly smaller, easier to handle, without compromising on sensing performance. This makes the maintenance of large sensor networks simpler, faster and more cost efficient than traditional wired or wireless systems.

Designed to scale up to million node networks, Quantum allows for higher resolution imaging and more complex survey geometries. It also provides increased topology freedom for various terrains across large survey areas.

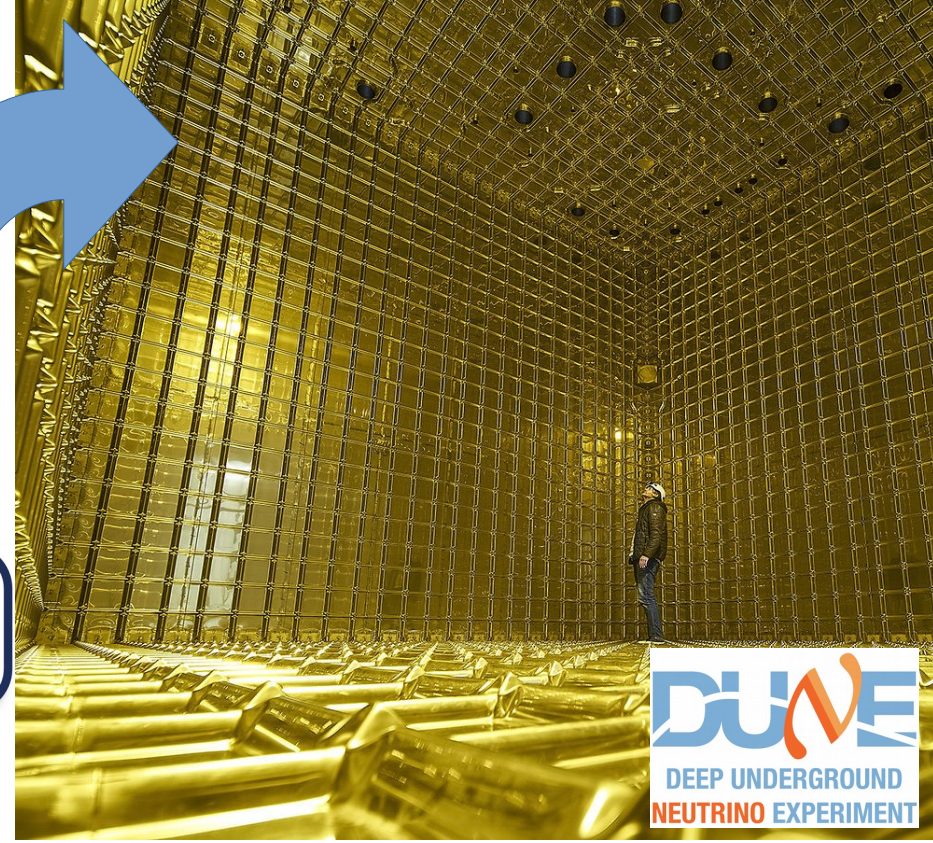
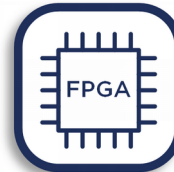
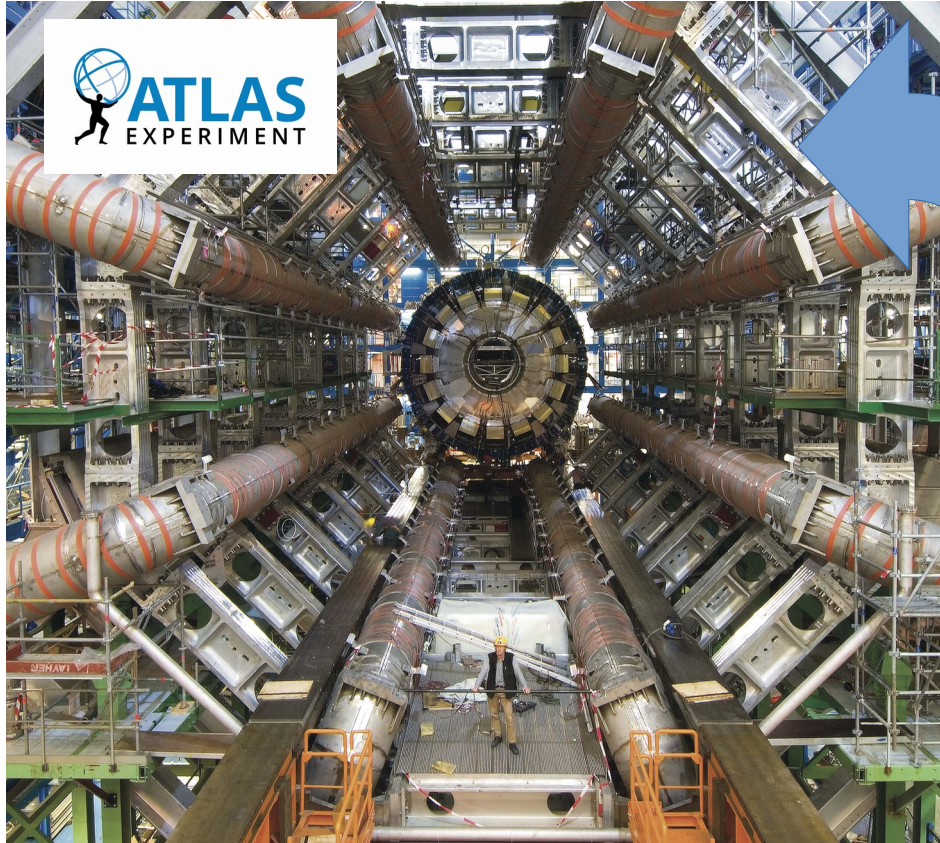
Quantum is available with Bluetooth quality control functions for in-field QC and configuration when required. This ensures consistent data quality and eliminates rework.

Our systems offer high signal fidelity, autonomous data recording with position and time stamping through GPS functionality, to enable accurate off-line data collection.

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



# Consultancy customer





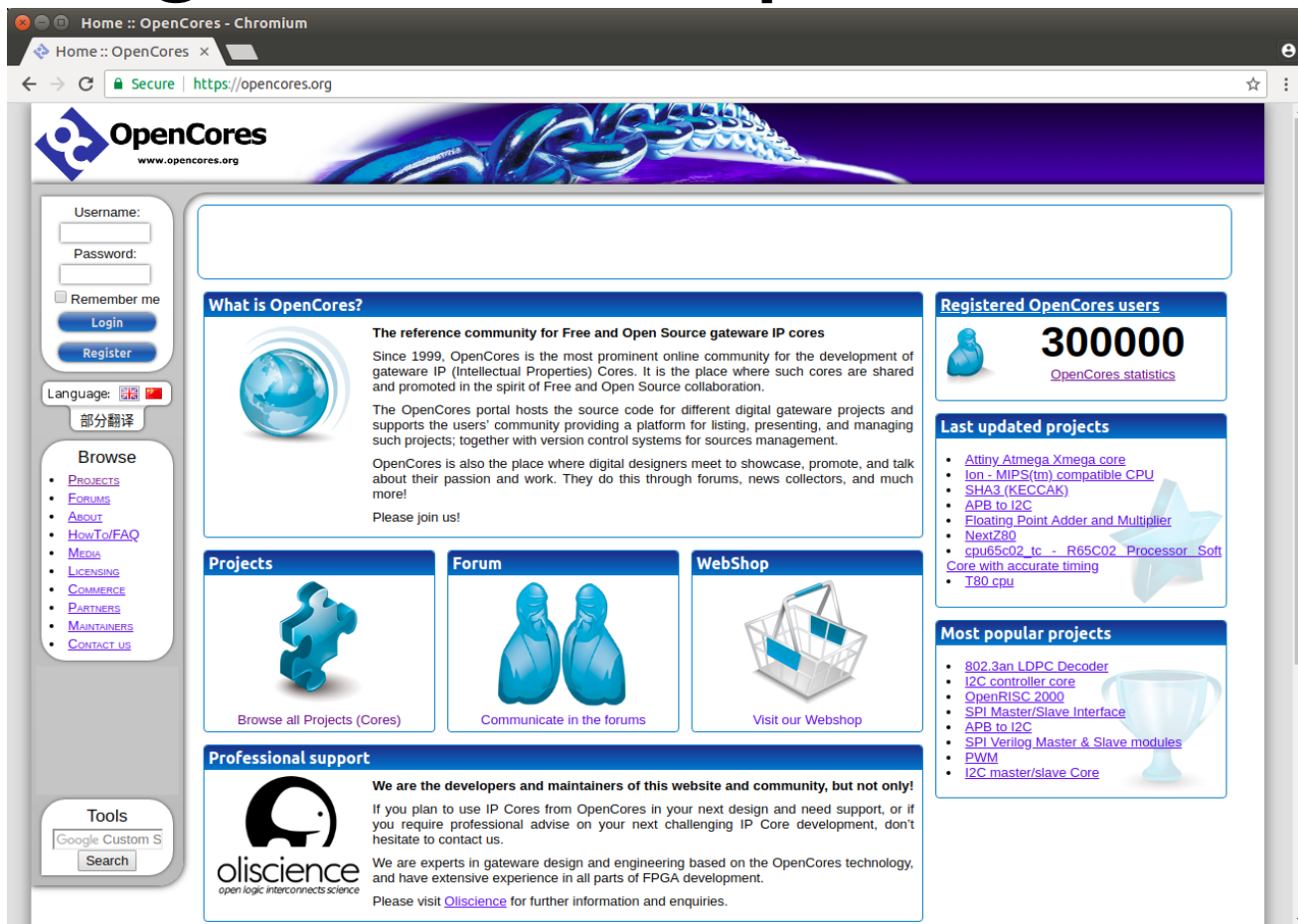
# Open source culture

## 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



The screenshot shows the OpenCores.org website interface. The browser address bar displays 'Home :: OpenCores - Chromium' and 'Home :: OpenCores x' with the URL 'https://opencores.org'. The website header features the OpenCores logo and a banner image of a blue chain. The main content area is divided into several sections:

- What is OpenCores?**: A section explaining the community's mission since 1999, providing a platform for sharing and promoting Free and Open Source gateway IP cores. It includes a globe icon and text about the portal's role in hosting source code and supporting the users' community.
- Registered OpenCores users**: A section showing a large blue number '300000' representing the number of registered users, with a link to 'OpenCores statistics'.
- Last updated projects**: A list of recent projects including 'Attiny Atmega Xmega core', 'lon - MIPS(tm) compatible CPU', 'SHA3 (KECCAK)', 'APB to I2C', 'Floating Point Adder and Multiplier', 'NextZ80', 'cpu65c02\_ic - R65C02 Processor Soft Core with accurate timing', and 'T80 cpu'.
- Most popular projects**: A list of popular projects including '802.3an LDPC Decoder', 'I2C controller core', 'OpenRISC 2000', 'SPI Master/Slave Interface', 'APB to I2C', 'SPI Verilog Master & Slave modules', 'PWM', and 'I2C master/slave Core'.
- Projects**: A section with a puzzle piece icon and the text 'Browse all Projects (Cores)'.
- Forum**: A section with an icon of two people and the text 'Communicate in the forums'.
- WebShop**: A section with a shopping basket icon and the text 'Visit our Webshop'.
- Professional support**: A section featuring the oliscience logo and text stating they are developers and maintainers of the website and community, offering professional support for IP Core development.

The left sidebar contains a login/register section with fields for Username, Password, and a 'Remember me' checkbox, along with 'Login' and 'Register' buttons. Below this is a language selection section with a dropdown menu and a '部分翻译' button. The bottom of the sidebar features a 'Browse' section with a list of links: PROJECTS, FORUMS, ABOUT, HowTo/FAQ, Media, LICENSING, COMMERCIAL, PARTNERS, MAINTAINERS, and CONTACT US. At the very bottom of the sidebar is a 'Tools' section with a 'Google Custom S' search bar and a 'Search' button.

# OpenCores.org in numbers

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- 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

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- 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

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- **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

# A call to action to partners

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**we develop, drive and promote  
the large OpenCores community**

consisting of:

- Research institutions
- Universities
- High-tech corporates

**you access resources on our portal  
and contribute fostering common practices**

## 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*





# In the public domain



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 Borgia, 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:**



# 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 



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



goals".

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

# In the public domain



What about OpenCores?

- ... and DARPA (US)

## Open Cores

- **1180 projects** (different IP-blocks)
- **283578 registered users**
- **1783 new registered users** during last month (August)
- **~500 000 page views** every month
- **~80 000 visitors** every month
- **~5:30 (min:sec)** Average time at website
- **~6 page views** per visitor (average)

### Common Issues:

- Documentation
- Quality!
- Abandoned projects
- Lack of collaboration
- License Terms

#### Registered OpenCores users



**283578**

[OpenCores statistics](#)

#### Last updated projects

- [ODESS Multicore Project](#)
- [NoC based MPSoC](#)
- [PCIe Gen3x8 DMA for virtex7](#)
- [UART to Bus](#)
- [AUTO DATA-RATE CHECKER](#)
- [SpaceWireSystemC](#)
- [UART 16550 core](#)
- [MPEG2 Video decoder](#)

#### Most popular projects

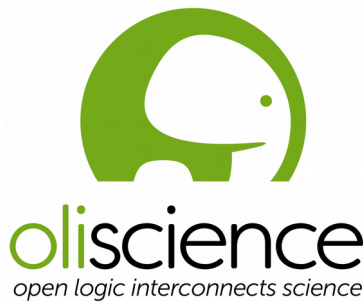
- [USB Host Core](#)
- [I2C controller core](#)
- [NEO430 Processor \(MSP430-compatible\)](#)
- [SPI Master/Slave Interface](#)
- [Ethernet 10GE Low Latency MAC](#)
- [I2C master/slave Core](#)
- [Reed Solomon Decoder \(204,188\)](#)
- [SPI Verilog Master & Slave modules](#)

Distribution Statement "A" (Approved for Public Release, Distribution Unlimited)

[https://www.darpa.mil/attachments/eri\\_design\\_proposers\\_day.pdf](https://www.darpa.mil/attachments/eri_design_proposers_day.pdf)

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# Thank you



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**OpenCores**

[www.opencores.org](http://www.opencores.org)

[www.opencores.org](http://www.opencores.org)

[www.oliscience.nl](http://www.oliscience.nl)

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

**Twitter:** @Oliscience101