Accelerating innovation and sharing knowledge through Open Hardware

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Outline

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Introduction
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Open Source Hardware
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Past challenges
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Future challenges and conclusions
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CERN's mission

Do basic science

- Components of matter
- Interactions

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Do basic science

- Components of matter
- Interactions

Communicate!

- Results of research
- Any other developments of use to society, coordinated by the Knowledge Transfer group

Science and Open Source

Open Source is good. . .

- For avoiding duplication of effort
- For getting peer review
- For maximizing impact on society
- For avoiding vendor lock-in
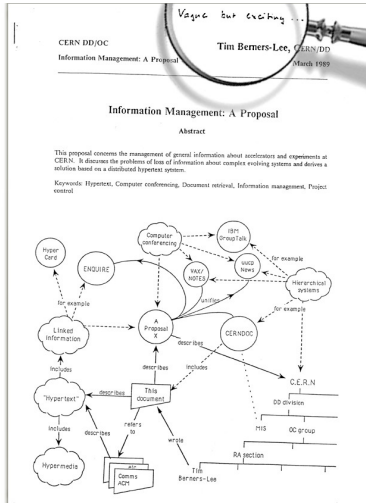- For guaranteeing basic freedoms to the users

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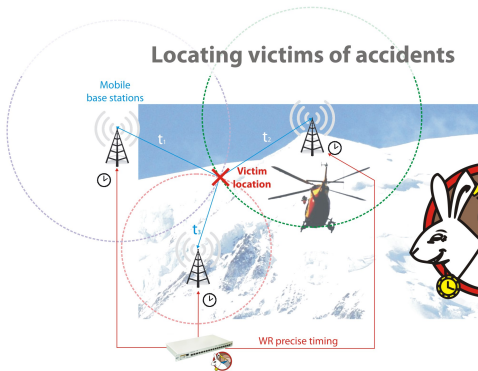- For guaranteeing basic freedoms to the users

And scientific research had already proven all of these points before!

CERN and innovation

A recent example of innovation
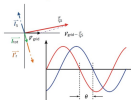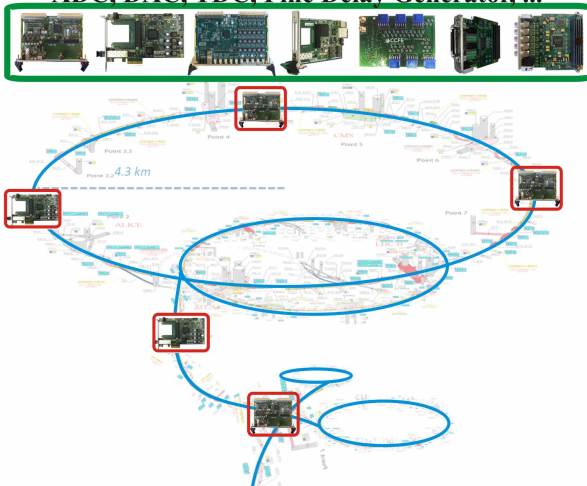

Locating victims of accidents

Smart power grids
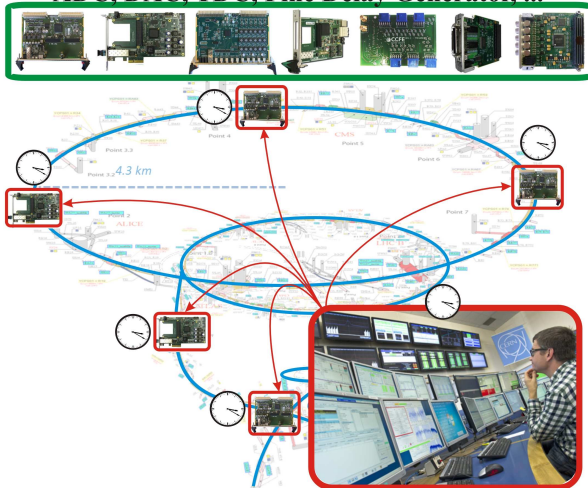
Beams – Controls – Hardware & Timing
Our place at CERN

ADC, DAC, TDC, Fine Delay Generator, ...

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A basic question

Could hardware design be as easy to share as software?

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There is an OSHW definition!

Check out http://www.oshwa.org/definition/

- Inspired by the Open Source definition for software.
- Focuses on ensuring freedom to study, modify, distribute, make and sell designs or hardware based on those designs.
- Now we know exactly what we mean when we say OSHW!

Layers of openness

- Openness is more important when the freedoms it affords can be easily used by many.
- Free access to knowledge and the ability of many to do something useful with it *can* trigger "revolutions", like the printing press, the industrial revolution and the Internet.

Empowerment

So could this trigger a revolution?

- Distributed design and manufacturing has become available to many.
- Mass production still means big players can manufacture more cheaply.
- But other motivations (ecology, independence...) could trigger a customer-driven change of scenario in the future.

Prosthetic hands

Safecast

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Water distribution

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# Example of a project in the Open Hardware Repository (ohwr.org)

A simple 4-lane PCIe carrier for FPGA Mezzanine Cards (VITA 57). It has memory and clocking resources and supports the White Rabbit timing and control network.

- **Detailed project information**

- Subprojects: **Software support for the SPEC board**
- Status: Beta
- Licence: CERN OHL

SPEC: Simple PCI Express FMC carrier
Made in Spain, The Netherlands & Poland
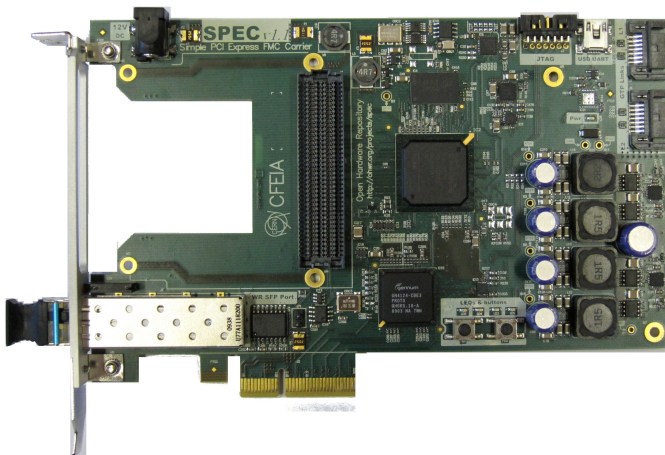
CERN Open Hardware License – ohwr.org/cernohl

Provides a solid legal basis

- Developed in collaboration with Knowledge Transfer Group at CERN.
- Better suited than non-HW licenses (GNU GPL, Creative Commons. . .)
- Defines conditions for using and modifying licensed material.

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Provides a clear legal environment

- Written in a clear, concise style.
- Easy for licensors to evaluate if this is good for them.

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Inspired by FOSS licenses

- Anyone can see the source (design documentation).
- Anyone is free to study, modify, manufacture and share.
- Any modification and distribution must happen under same license.
- Persistence makes everyone profit from improvements.

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Takes into account hardware production and distribution

- When producing and distributing licensee is invited to inform the licensor.
- Distributed HW must come with documentation.

Business models: dispelling the commercial vs open myth

	Commercial	Non-commercial
Open	**Winning combination. Best of both worlds.**	Whole support burden falls on developers. Not scalable.
Proprietary	Vendor lock-in.	Dedicated non-reusable projects.
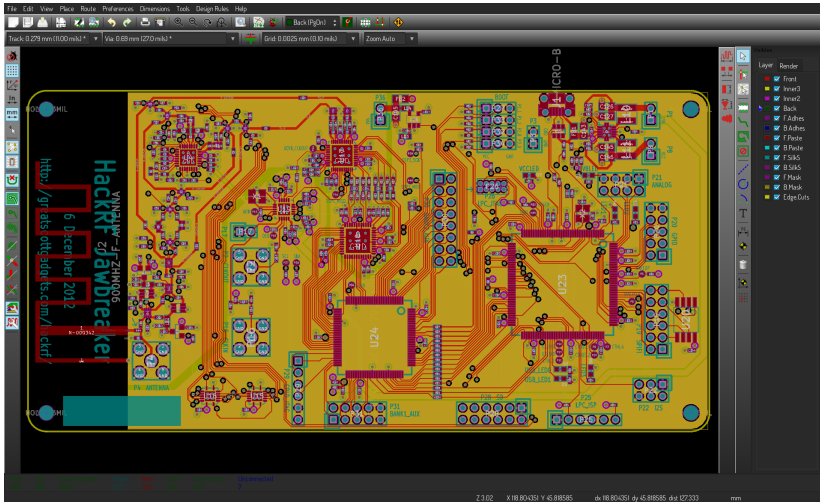
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Free design tools

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Economic

Some people would like to but cannot afford to work on open source. Can some bright economist work out a solution?

Legal

Licensing of free software is mostly based on copyright. This has limits when applied to hardware. We may need to explore other instruments, like contracts and marks.

The role of public institutions

The goal here is not profit but to maximize impact on society.
We need tools to quantify impact of OSHW and free software,
and a bit of organization.

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Six years of experience show it works