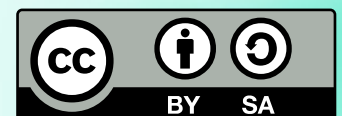


Free/Libre Open Technologies for Science and Education



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Outline

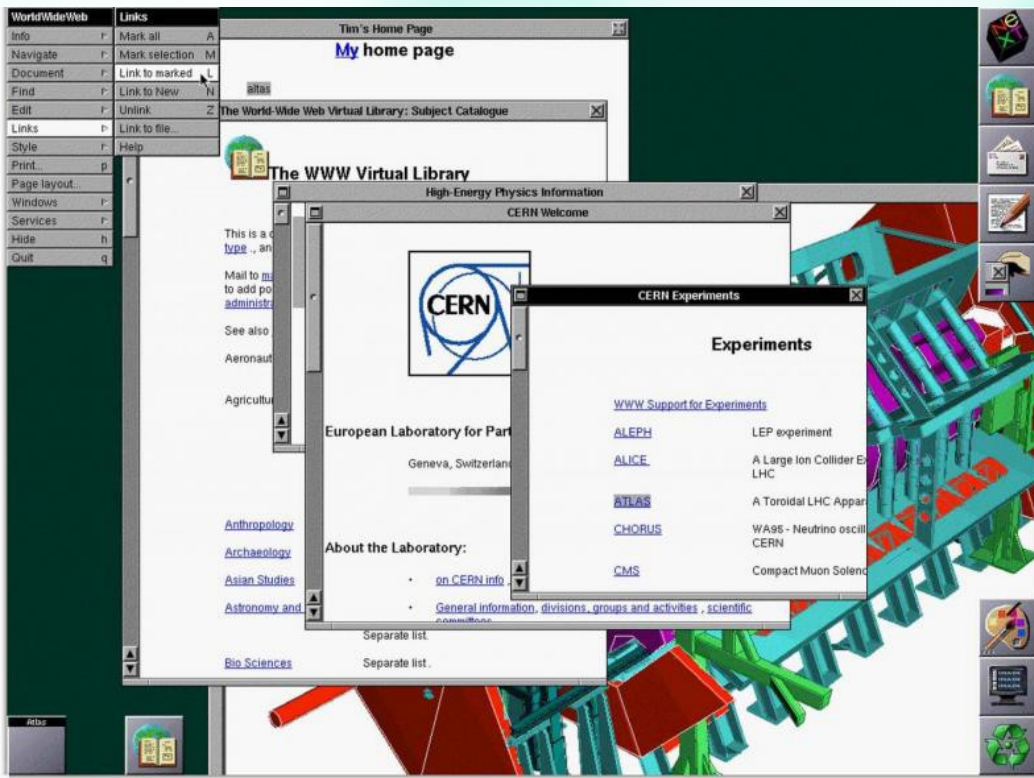
- Open and Citizen Science
- Open Educational Resources
- Open Knowledge
- Scientific Instruments
- Open entrepreneurship
- Final remarks

Communication



The birth of the WWW

- 1993 – CERN put the WWW software in the public domain

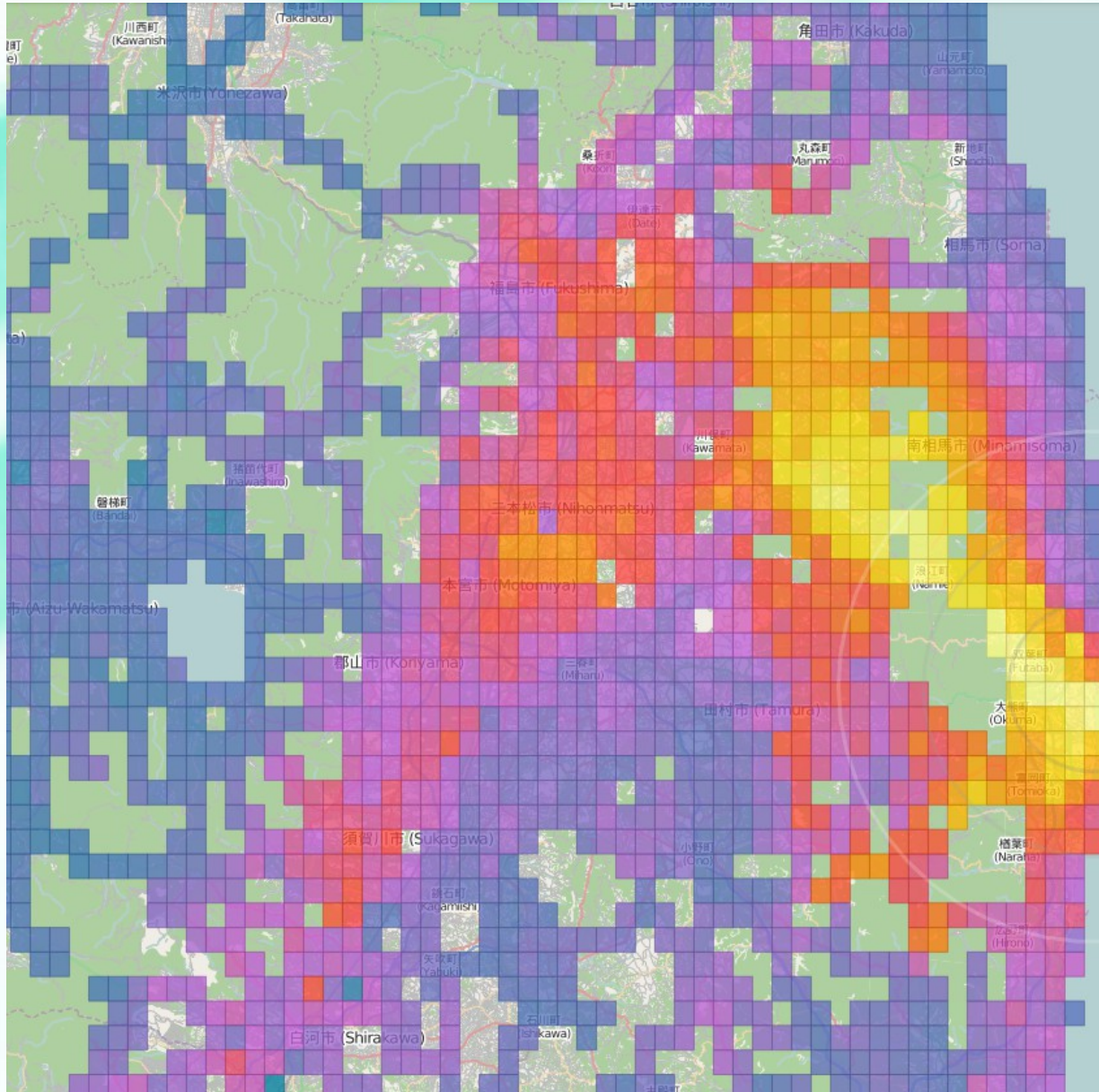


- Example of how opening up methods for the practice of science can benefit society

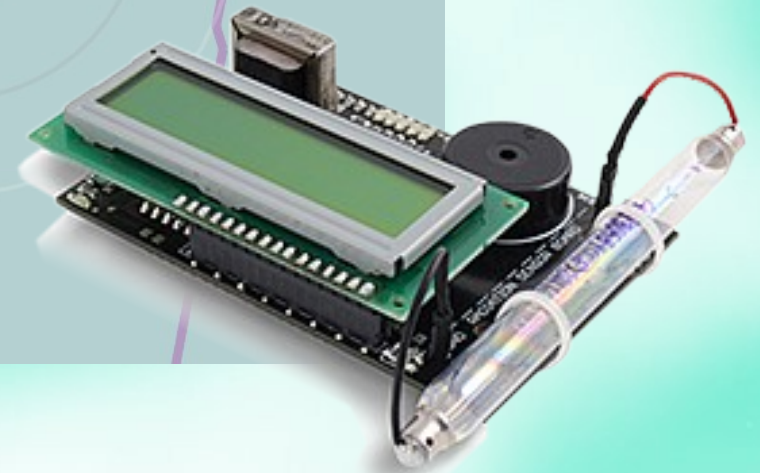
<http://home.web.cern.ch/about/updates/2013/04/twenty-years-free-open-web>

Image: Tim Barners-Lee

Citizen Science and Open Science



- Citizen monitoring of the Fukushima accident in 2011
- Methods and data openly accessible to any citizen



Open Knowledge

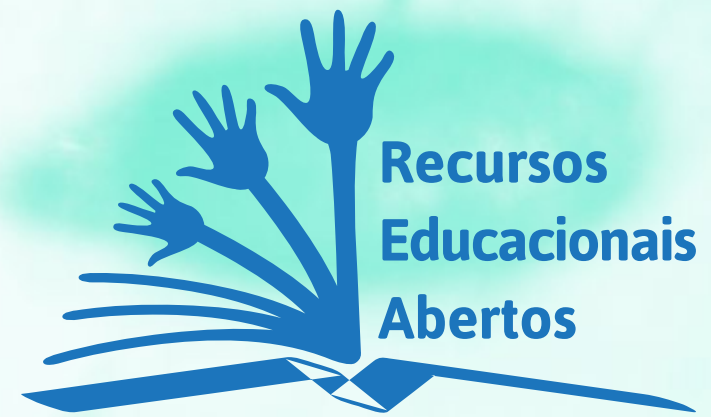
How to allow effective use of knowledge available in the internet

- Properties
 - Use
 - Study
 - Modification
 - Sharing
- Requirements
 - Legal
 - Technical

Licensing

- Free software licenses
 - GPL, Apache, MIT, ...
- Content Licenses
 - Creative Commons
- Open Hardware
 - CERN Open Hardware License, TAPR

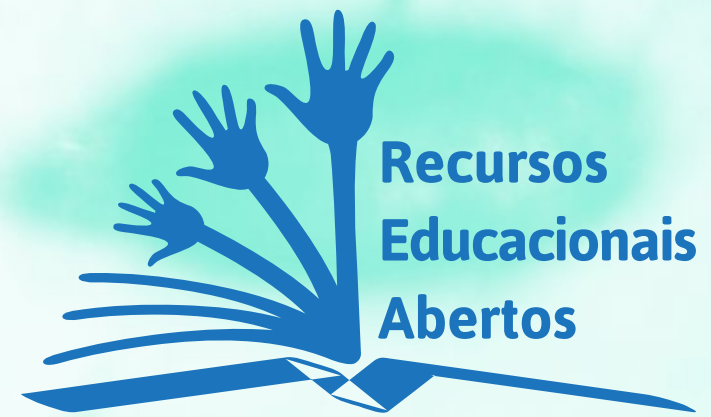
Open Educational Resources (OER)



UNESCO OER logo
(portuguese translation)

- Concept adopted by UNESCO in 2002
- the UNESCO World Open Educational Resources (OER) Congress released the 2012 Paris OER Declaration which called on governments to openly license publicly funded educational materials.

Open Educational Resources (OER)



UNESCO OER logo
(portuguese translation)

- “Open Educational Resources are teaching, learning and research materials that are in public domain or open licensed..”
- “... it's availability in open technical formats facilitates the potential reuse of digital available materials”
 - UNESCO/Commonwealth of Learning in collaboration with OER-Brazil Community (2011)
 - <http://rea.net.br/site/o-que-e-rea/>

Scientific and educational Instruments

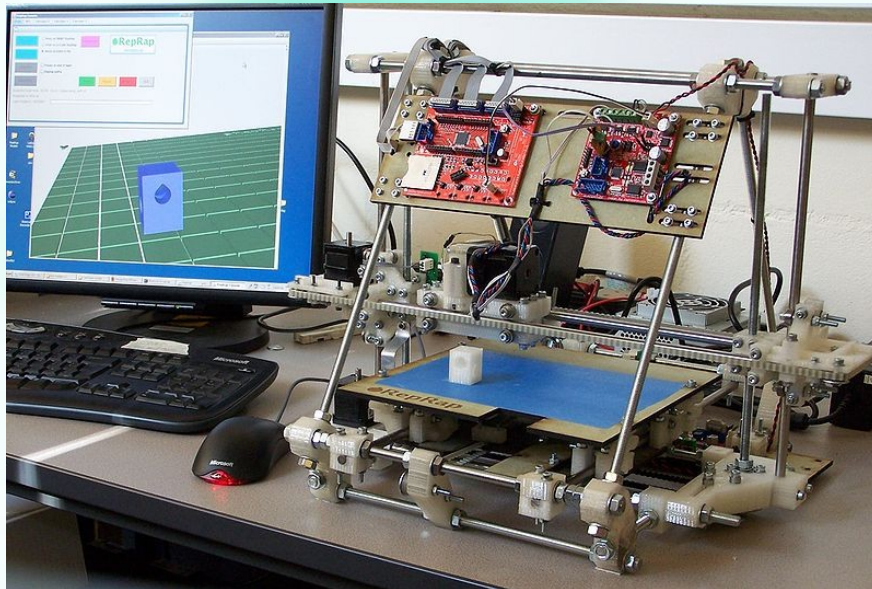
Building Research Equipment with Free, Open-Source Hardware

Joshua M. Pearce

www.sciencemag.org **SCIENCE** VOL 337 14 SEPTEMBER 2012

Published by AAAS

- Open source 3D printer



<http://en.wikipedia.org/wiki/Reprap>

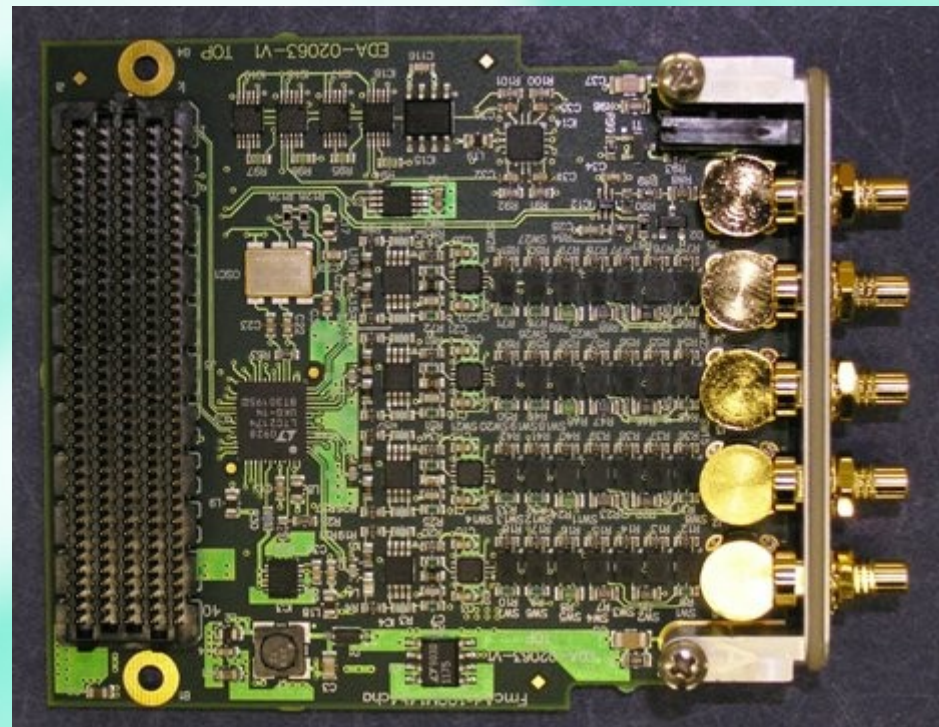


http://www.appropedia.org/Open-source_lab_jack

8-fold reduction in equipment cost

CERN Open Hardware

- Analog/Digital converter: 14bits resolution, 100 MHz sample rate



Center for academic technology



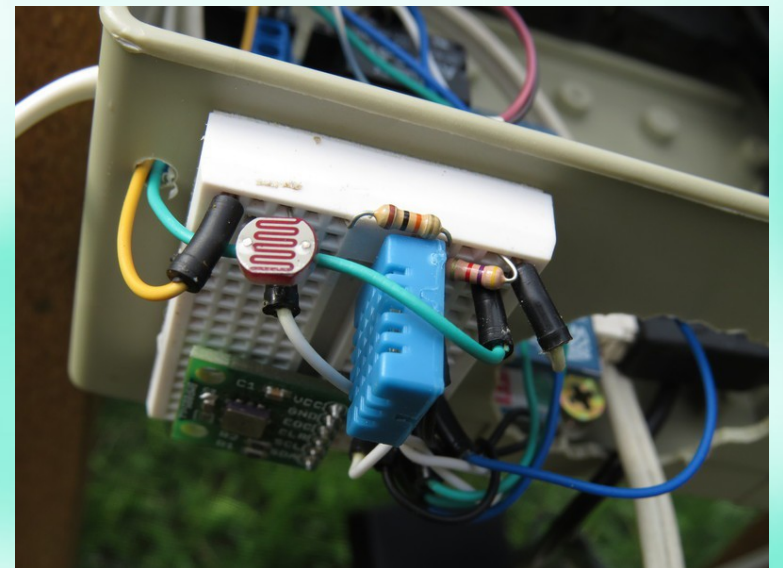
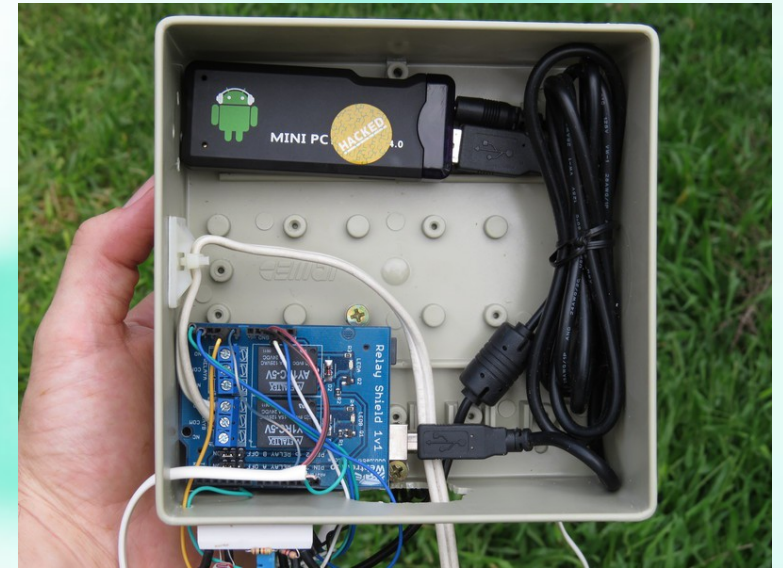
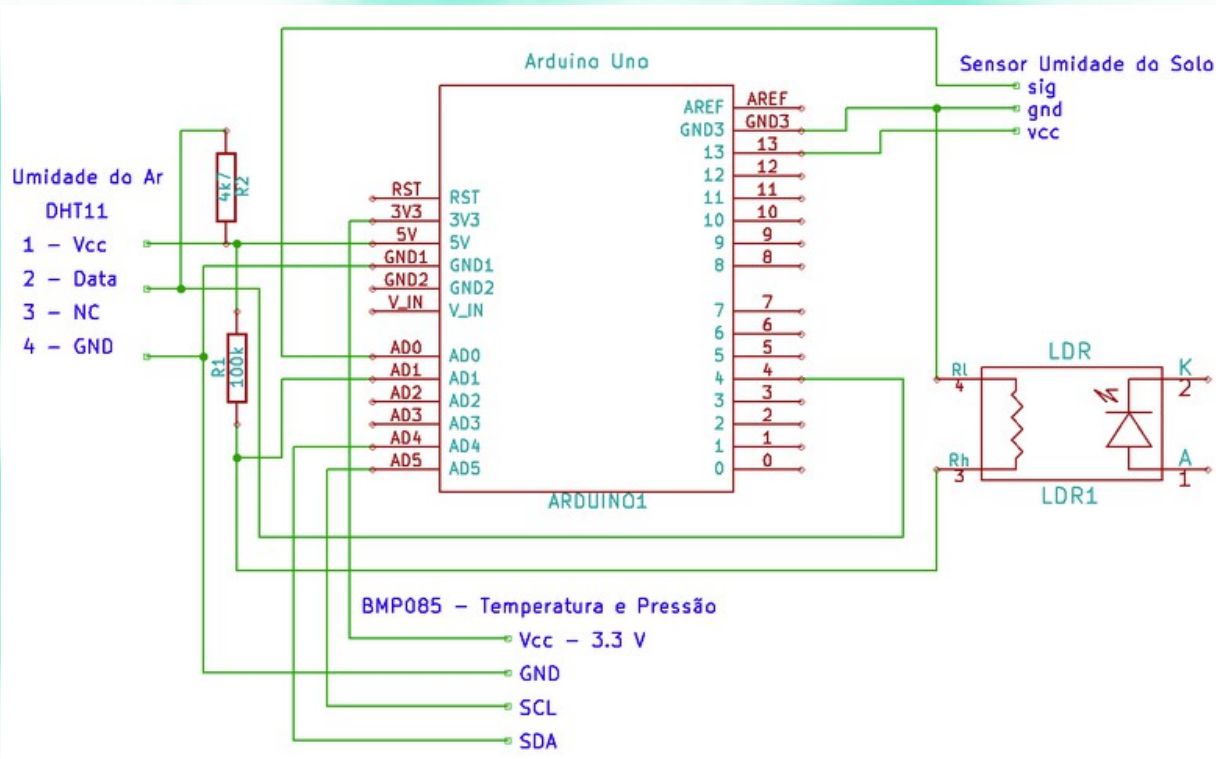
- Technologies that can be used, studied, modified and distributed
 - Four properties of knowledge
- Scientific and educational applications
- Researching methods of developments, licenses, tools and applications of free/libre technologies

<http://cta.if.ufrgs.br>

Modular weather station for education and citizen science

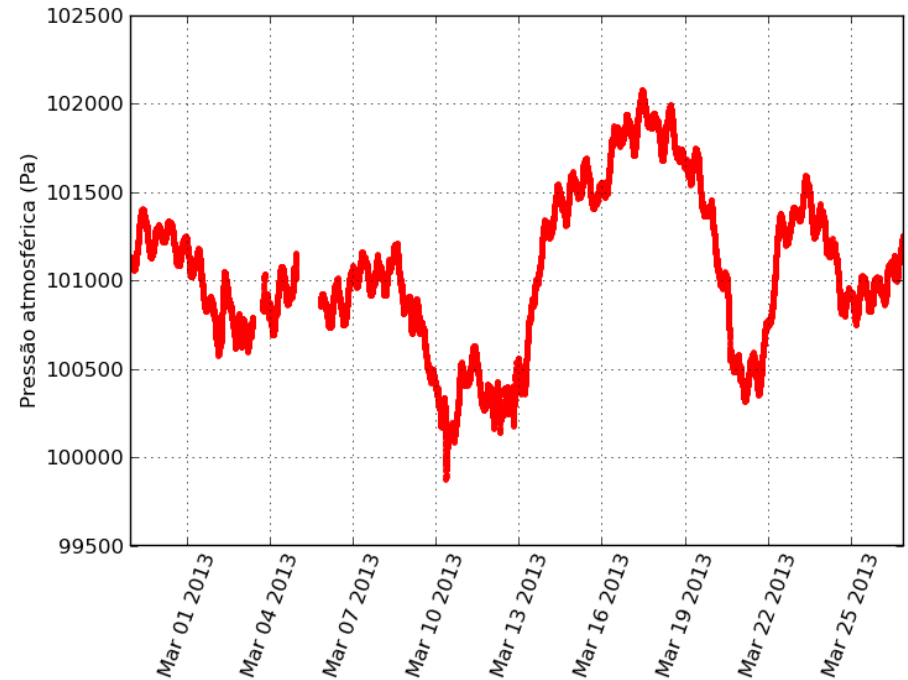
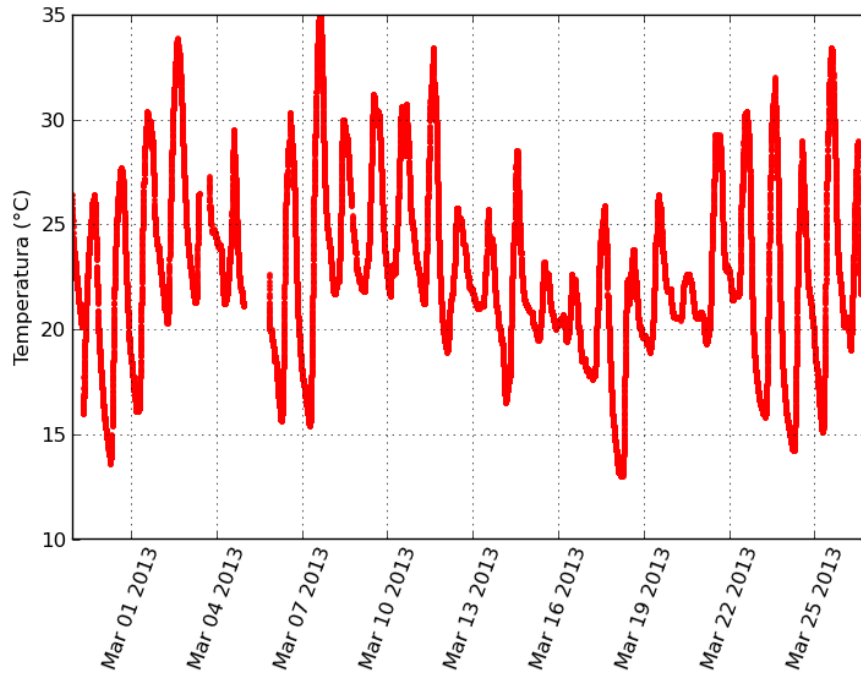
- Weather and environmental monitoring (ex. air quality)
 - Pedagogy for technological and scientific initiation
 - Teaching physics, chemistry, math, geography, engineering
- Assembly and use in schools, households, agriculture...
- Pilot project: students learn how to build and manage a prototype station, then disseminate their knowledge (including to teachers) in workshops

Open hardware prototype

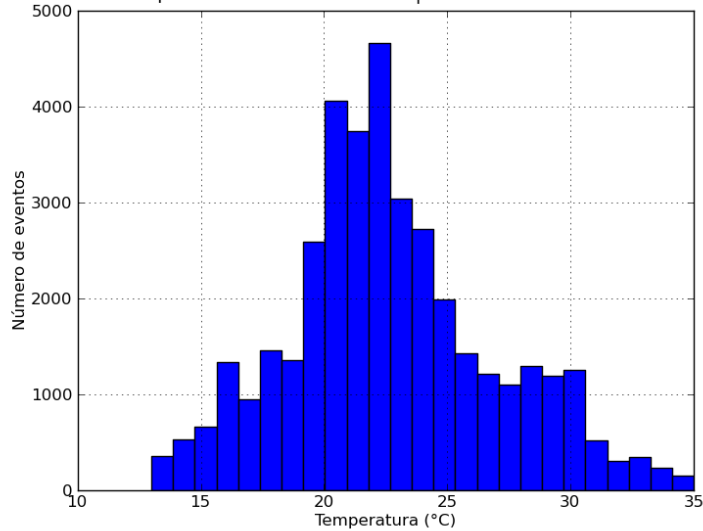


- **TODO:**
 - Air quality
 - Build a network
 - Communication protocol
 - Database

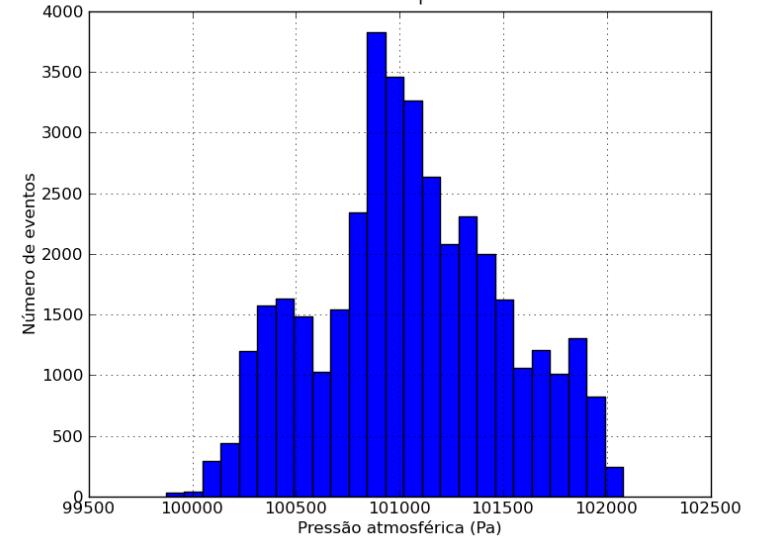
Modular weather station: sample data



Temperatura média: 22.67°C | Desvio Padrão: 4.22°C



Pressão média: 101048.66 Pa | Desvio Padrão: 447.94 Pa

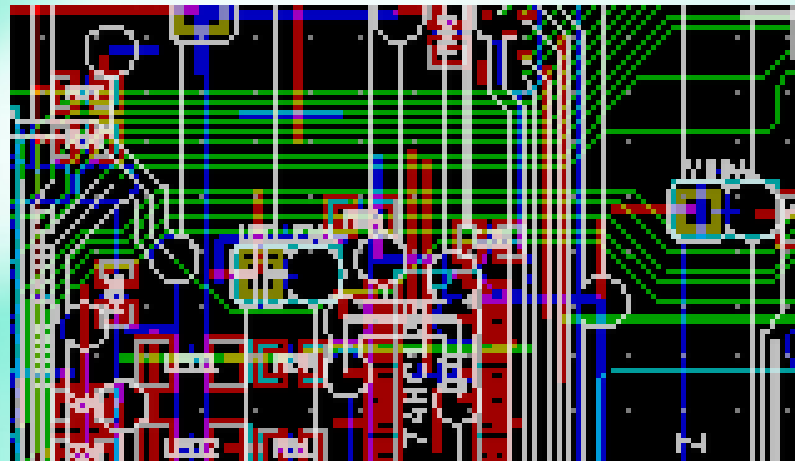


Open technologies in the market

- Reference: free-software based business
 - Consulting
 - Supporting
 - Training
 - Tailored development
- Demand for open technologies is much higher than the supply. See: [Elphel Open Source Camera Licensing Page](#)

Challenges

- Open standards and **open tools** for the development of open technologies
- CAD software for electronic schematics and circuit board design



Open technologies in the market

- Reference model: free-software based business
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[Elphel Open Source Camera Licensing Page](#)

Final remarks

- Openness in science and education, their methods, and outcomes
 - Results in benefits to the society
 - Qualifies education (Open educational Resources - OER)
 - Democratizes knowledge

Thanks for your attention

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Credits

- Check image sources for reuse information

First commercial microprocesso Intel 4004 – Image Source [Wikipedia](#)