Spreading remote lab usage

A System – A Community – A Federation

Co-funded by the
Erasmus+ Programme
of the European Union

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Inspiration

"*The only way to learn the language of nature is performing many experiments in laboratories that can be hands-on or remote*"

Ingvar Gustavsson

The value of experimentation in Engineering Education

Royal Society motto 'Nullius in verba'

"… express the determination of its Fellows … to verify all statements by an appeal to facts determined by experiment."

The value of combining theory and practice traced back to the 1st engineering school in the United States, the U.S. Military Academy, founded at West Point, N.Y. in 1802 [2, p. 122].

Five Major Shifts in 100 Years of EE

1. a shift from hands-on and practical emphasis to engineering science and analytical emphasis
2. a shift to outcomes-based education and accreditation
3. a shift to emphasizing engineering design
4. a shift to applying education, learning, and social-behavioral sciences research
5. a shift to integrating information, computational, and communications technology in education

Froyd, Wankat, and Smith (2012)

Five Major Shifts in 100 Years of EE

5. a shift to integrating ICT in education
   - content delivery: television, videotape, and the Internet
   - programmed instruction: individualized student feedback
   - personal response systems (clickers)
   - computational technologies
   - intelligent tutors: second phase of individualized student feedback
   - **simulations**
   - games and competitions
   - **remote laboratories**
   - grading

Froyd, Wankat, and Smith (2012)

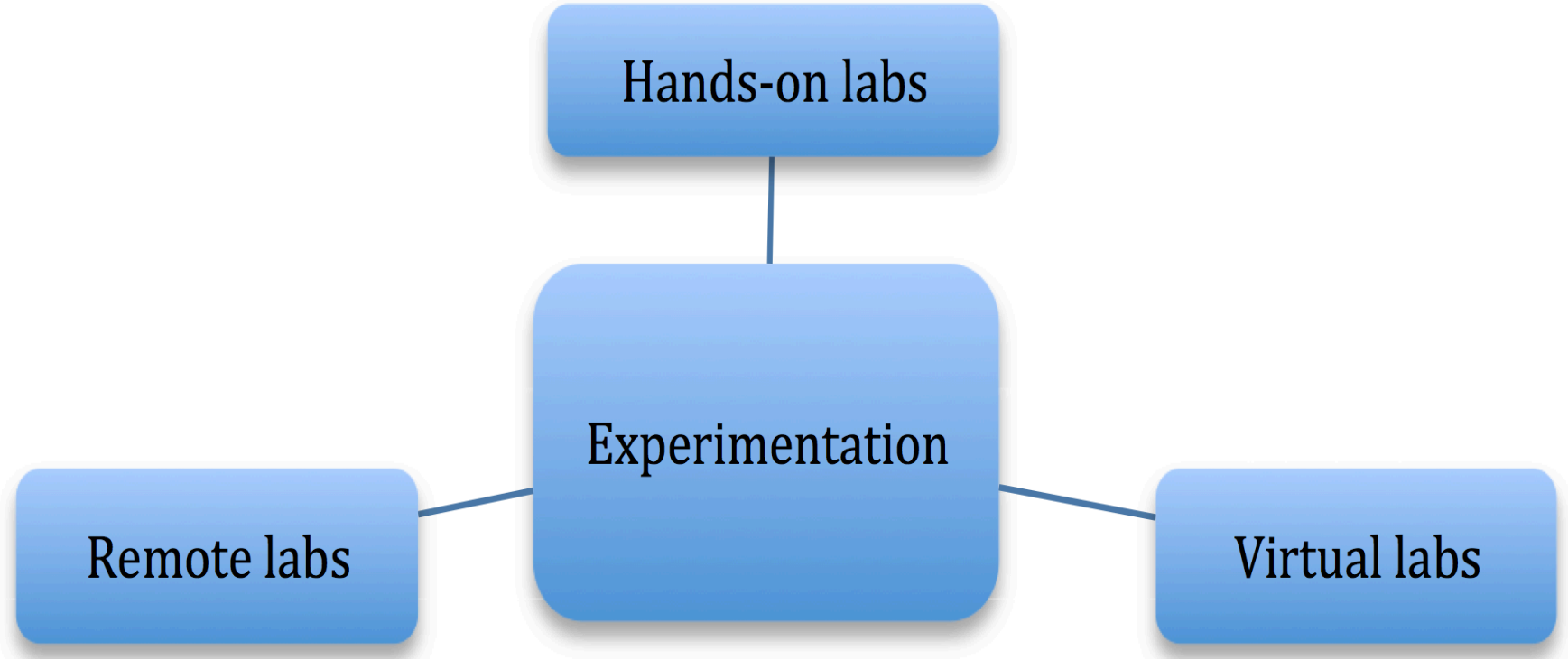
The Role of the Laboratory in Undergraduate EE

- The Fundamental Objectives of Engineering Instructional Laboratories

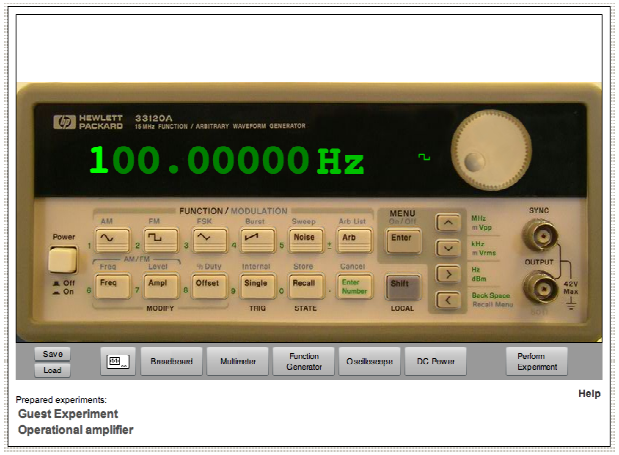
- Objective 1: Instrumentation
- Objective 2: Models
- Objective 3: Experiment
- Objective 4: Data Analysis
- Objective 5: Design
- Objective 6: Learn from Failure
- Objective 7: Creativity
- Objective 8: Psychomotor
- Objective 9: Safety
- Objective 10: Communication
- Objective 11: Teamwork
- Objective 12: Ethics in the Lab
- Objective 13: Sensory Awareness

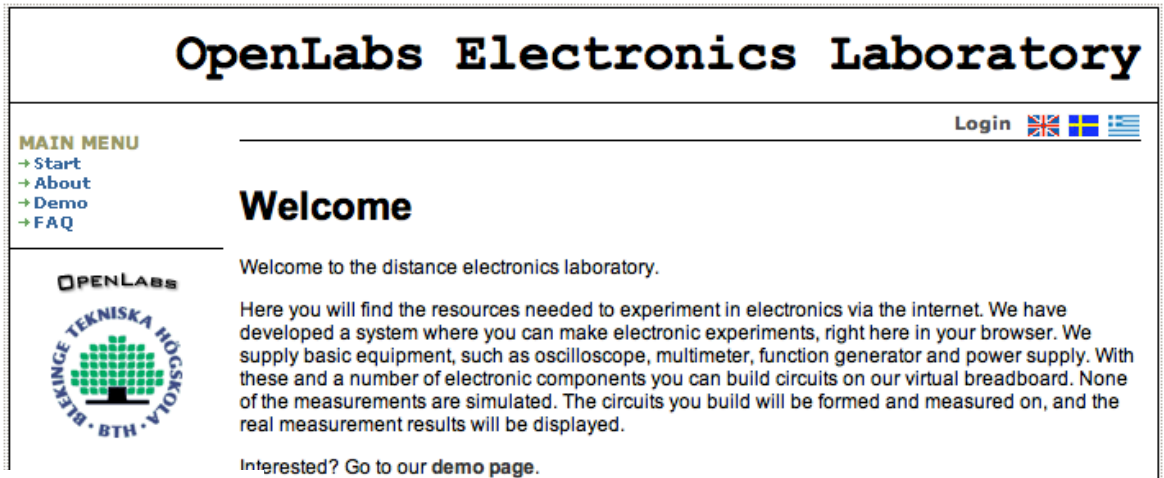
Feisel and Rosa (2005)

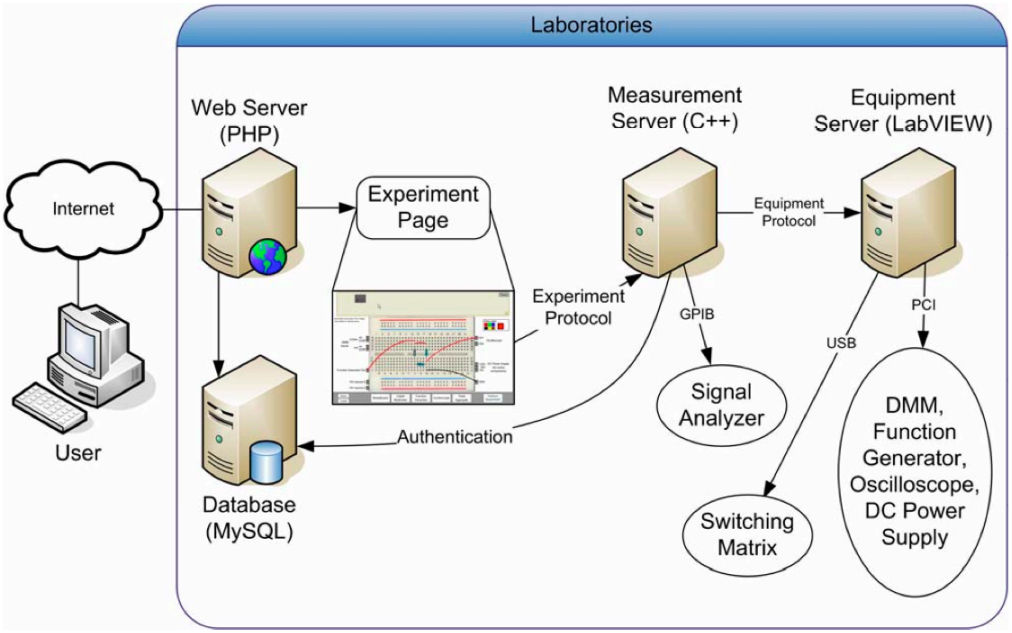
Different lab environments for performing experiments in STEM



Virtual Instrument Systems in Reality (VISIR)



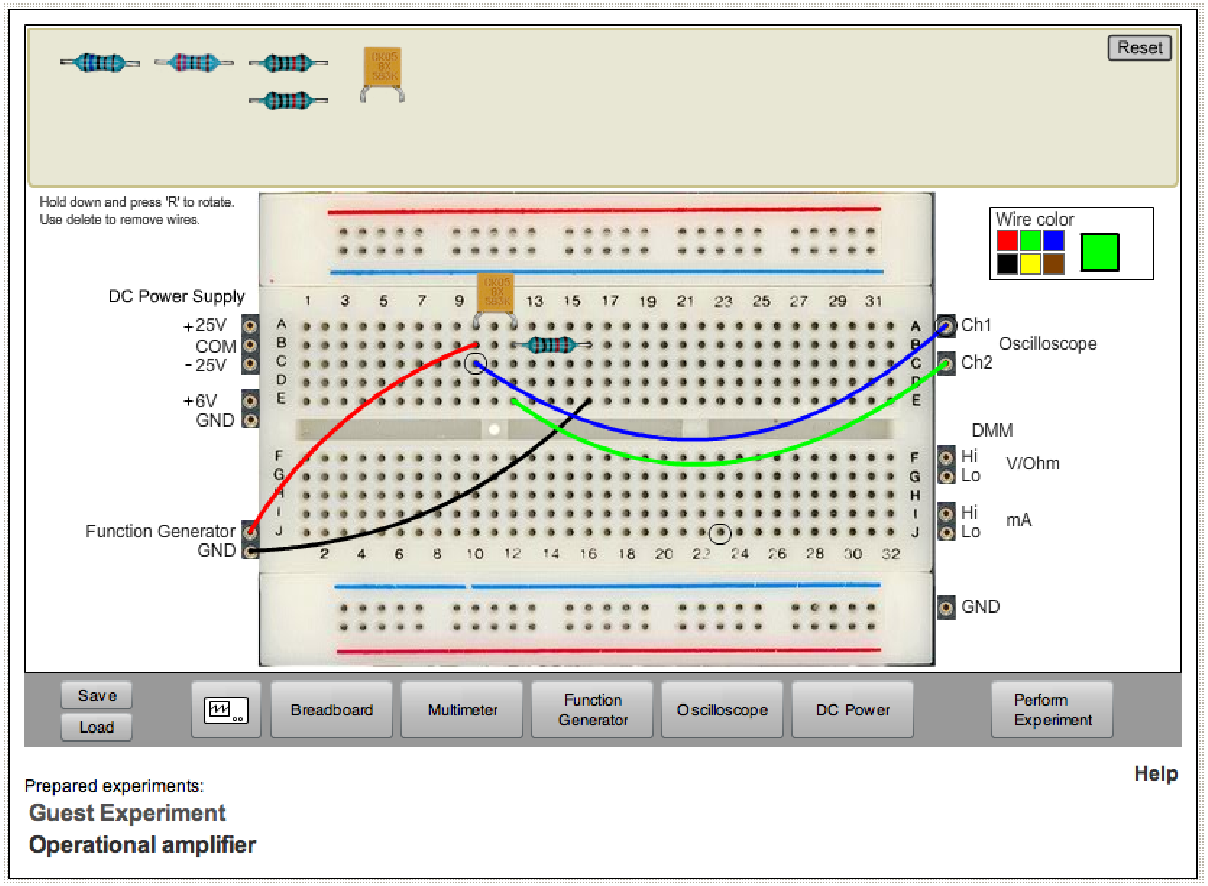


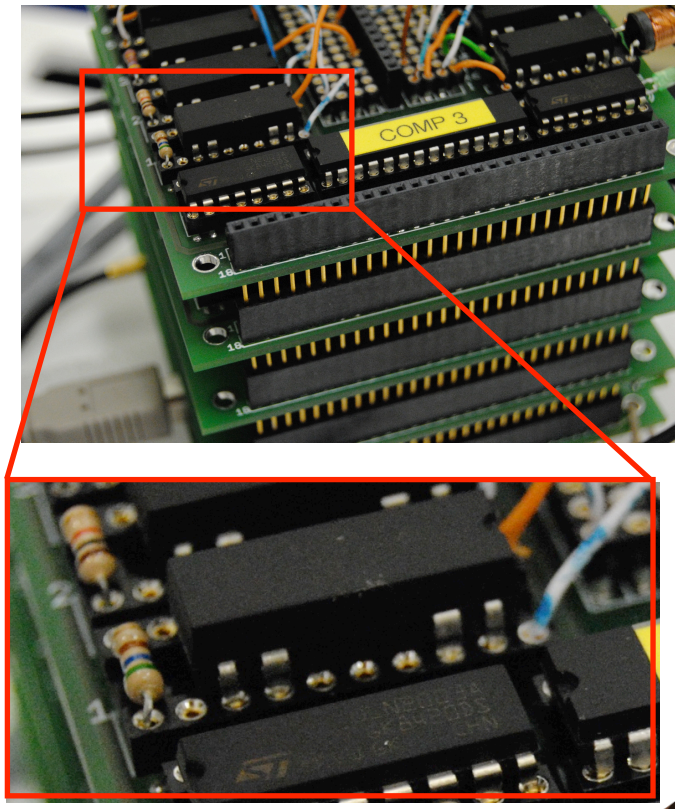


The measurement hardware

ou have any questions about this page or the laboratory, contact the **administrator**.

Virtual Instrument Systems in Reality (VISIR)





VISIR Laboratories

- University of Deusto, Spain
- FH Campus Wien University of Applied Sciences, Austria
- Blekinge Institute of Technology, Sweden
- Carinthia University of Applied Sciences (CUAS), Austria
- School of Engineering – Polytechnic of Porto, Portugal
- National University for Distance Education, Spain
- Indian Institute of Technology Madras, India
- Batumi Shota Rustaveli State University, Georgia

The GOLC award 2015

Global Online Laboratory Consortium

GOLC 2015 Online Lab Award

The GOLC Online Laboratory Award 2015 in the category

„Remote Controlled Lab“

is presented to

VISIR (Virtual Instrument Systems in Reality)

Submitted by:

Ingvar Gustavsson, Gustavo Alves, Thomas Fischer, Javier Garcia Zubia, Felix Garcia, Manuel Castro

Awarded during the 12th International Conference on Remote Engineering and Virtual Instrumentation (REV2015) in Bangkok, Thailand

Abul K. M. Azad
President

Michael E. Auer
Secretary General

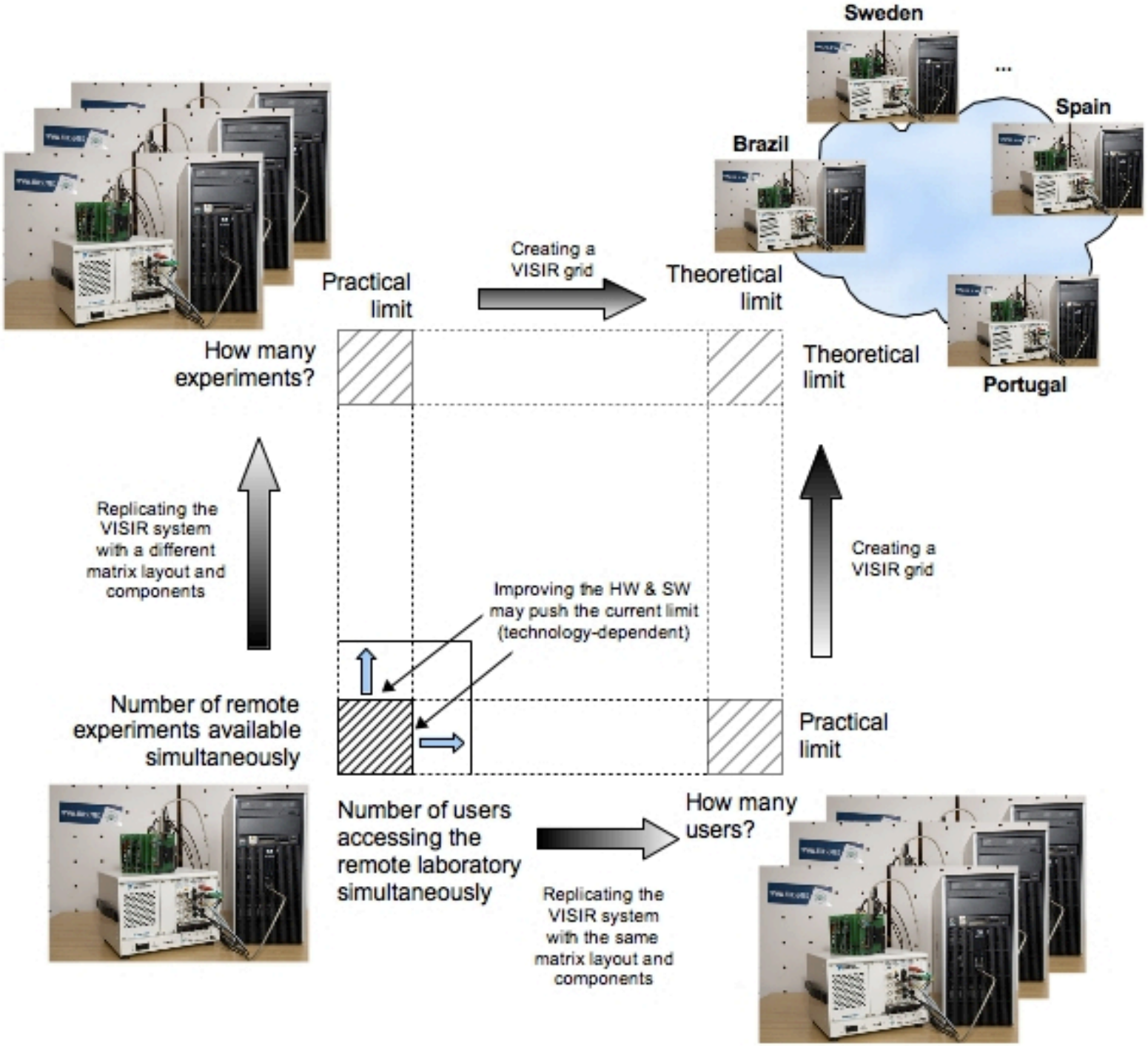
From Erasmus+ ... ... to VISIR+

- **Erasmus+** is the EU Programme in the fields of education, training, youth and sport for the period 2014-2020.
  - KEY ACTION 2: Cooperation for Innovation and the Exchange of Good Practices
    - Capacity Building in the field of higher education
- Giving the presented background a proposal was submitted
  - Educational Modules for Electric and Electronic Circuits Theory and Practice following an Enquiry-based Teaching and Learning Methodology supported by VISIR

Numbers matter ...

- PhET Interactive Simulations, from the University of Colorado, US, reports over one hundred million (100,000,000) simulations delivered in 2013, after a time period of approx. 10 years.

- VISIR registered thirteen thousand accesses (13,000) in 2015, for a period of approx. 8 years [11].


Sweden
...
Spain
Brazil
Portugal
Creating a VISIR grid
Practical limit
Theoretical limit
How many experiments?
Theoretical limit
Replicating the VISIR system with a different matrix layout and components
Creating a VISIR grid
Improving the HW & SW may push the current limit (technology-dependent)
Number of remote experiments available simultaneously
Practical limit
Number of users accessing the remote laboratory simultaneously
How many users?
Replicating the VISIR system with the same matrix layout and components

… VISIR+

“ Allow **more** students to perform more experiments”

… PILAR

" Allow **more** students to perform **all** experiments"

… to infinity and beyond

" Allow **all** students to perform **all** experiments"

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Thanks for your attention!

Any doubts or questions?

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