# Laboratórios remotos: Um Experimento Internacional de Educação em Engenharia

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

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COBENGE 2016
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DE EDUCAÇÃO EM ENGENHARIA
"20 Anos de REENGE
Caminhos da Engenharia"

# Fundamentos

- Five Major Shifts in 100 Years of Engineering Education
  - Froyd, Wankat, and Smith (2012)
- The Role of the Laboratory in Undergraduate Engineering Education
  - Feisel and Rosa (2005)
- Remote Experimentation Network - Yielding an Inter-University Peer-to-Peer e-Service
  - Alves et al. (2005)
- Virtual Instrument Systems in Reality (VISIR)
  - Gustavsson et al. (2006)

# 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. <u>a shift to applying education, learning, and social-behavioral sciences research</u>
5. <u>a shift to integrating information, computational, and communications technology in education</u>

# Five Major Shifts in 100 Years of EE

4. <u>a shift to applying education, learning, and social-behavioral sciences research</u>
   - Educational Objectives, Mastery, and Student Learning Outcomes
   - Student Engagement
   - **<u>Inquiry</u>**
   - Integrated Approach to Course and Program Design
   - Importance of a Broader Range of Knowledge, Skills, and Attributes
   - Scholarly Approach to Engineering Education through the Scholarship of Teaching and Learning (SoTL) and Engineering Education Research

# Five Major Shifts in 100 Years of EE

5. <u>a shift to integrating ICT in education</u>
   - 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
   - **<u>simulations</u>**
   - games and competitions
   - **<u>remote laboratories</u>**
   - grading

# 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

# Questões

- Qual o aporte de cada tipo de laboratório (real, virtual, remoto) na prossecução de cada um desses objetivos?

- Qual o impacto do estilo de aprendizado de cada aluno e aluna na seleção da melhor estratégia didática de utilização desses tipos de laboratório?

- Como usar esses recursos (laboratórios) para endereçar a aprendizagem individual, i.e. um dos 14 grandes desafios da Engenharia para o séc. XXI?

# The ALFA-II-465-A RexNet-yippee project

… see 1st slide


- Proposal
  - submitted October 2003 – accepted July 2004
- Project
  - Start: January 2005
  - Duration: 24 months
  - Consortium: 10 Institutions of Higher Education (IHE)
    - 5 European (3 countries) and 5 Latin American (3 countries)
  - Total budget: € 174.015,00 (EC contribution: € 129.695,00)

www.rexlab.net

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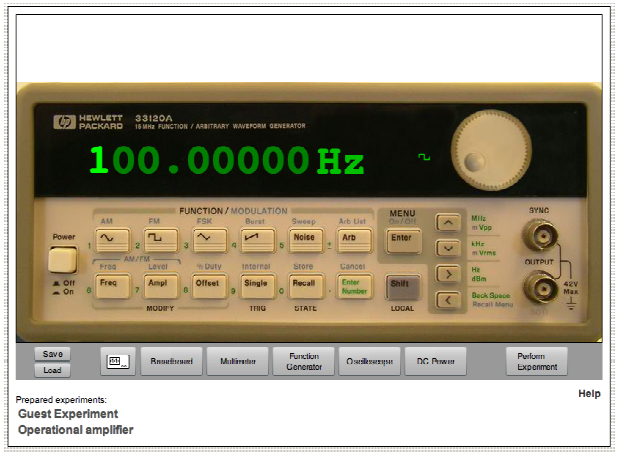
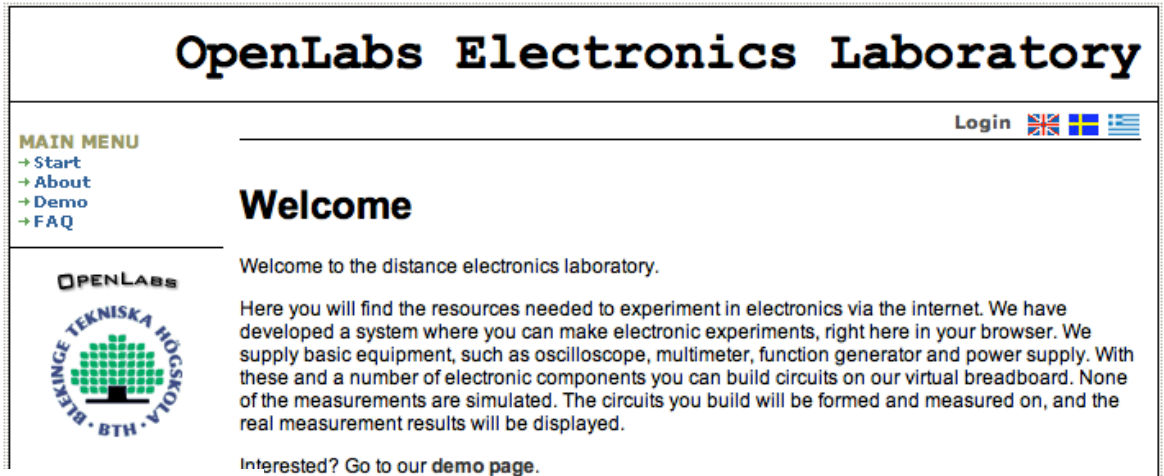
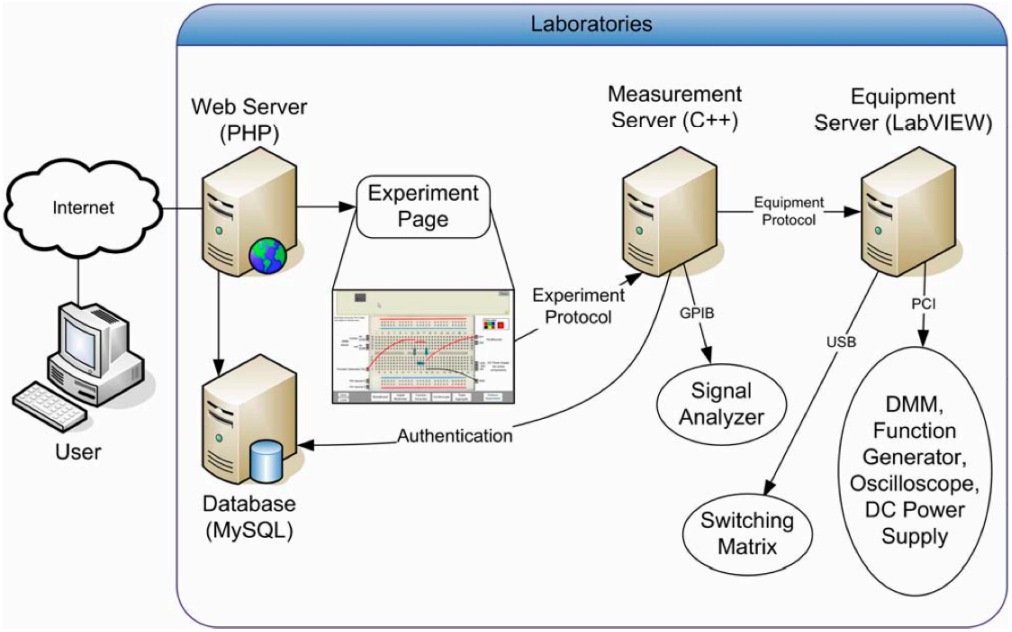
# Virtual Instrument Systems in Reality (VISIR)



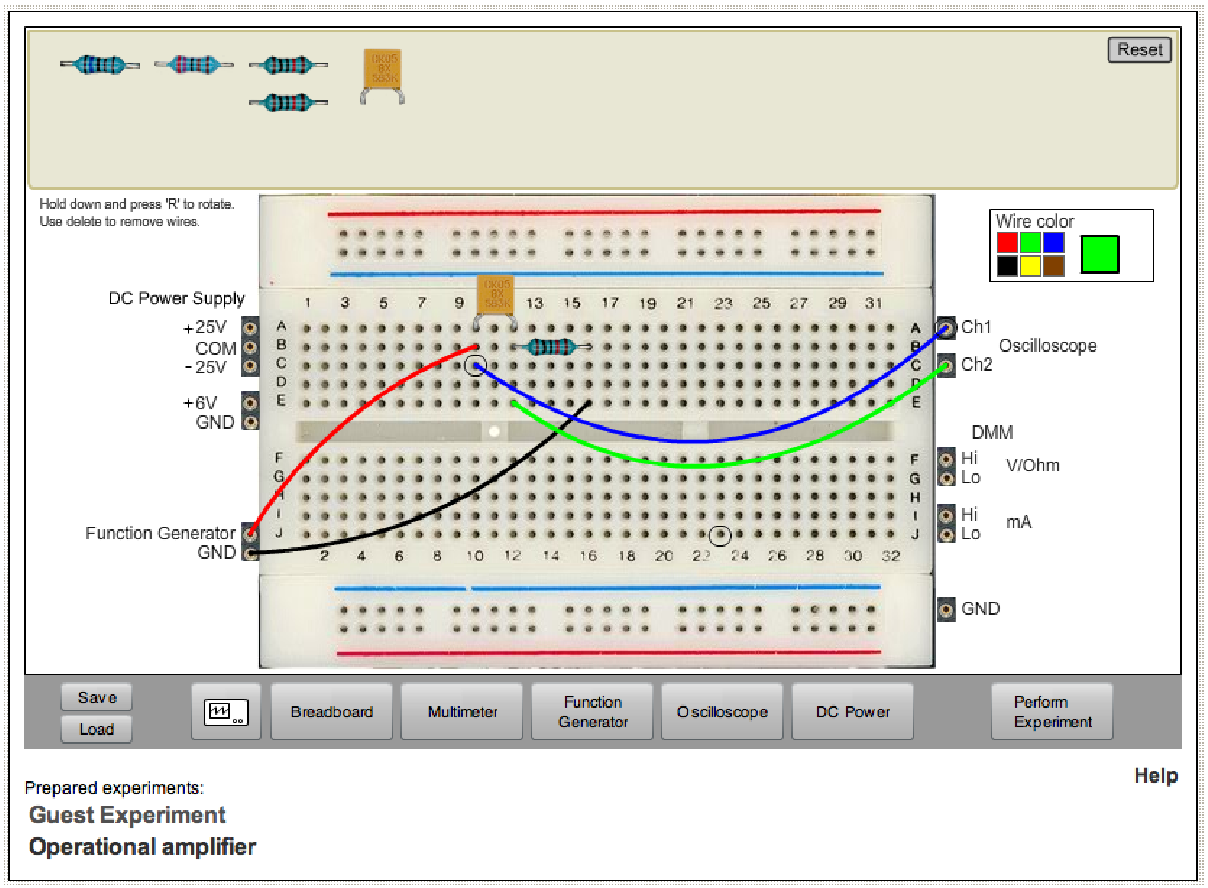



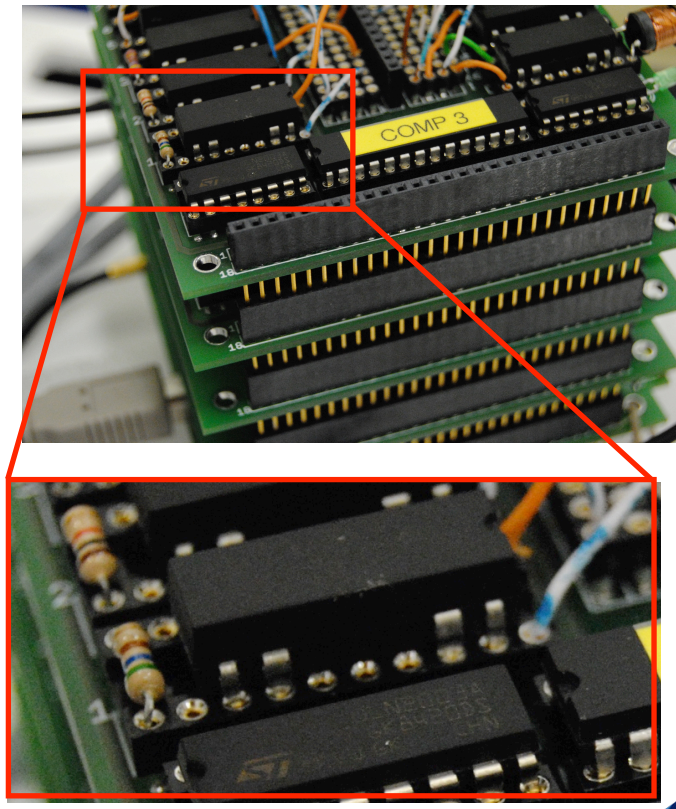


*The measurement hardware*

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

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# 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

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# Do Erasmus+ ...

- **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
- Com base nos fundamentos apresentados, submeteu-se uma proposta de projeto ao programa Erasmus+
  - Educational Modules for Electric and Electronic Circuits Theory and Practice following an Enquiry-based Teaching and Learning Methodology supported by VISIR

# ... ao VISIR+

Módulos Educacionais para a teoria e prática sobre circuitos elétricos e eletrônicos baseados em uma metodologia de ensino e de aprendizagem por indagação, assistidos pelo VISIR

- O título sintetiza todo o racional e enfoque do projeto
  - Módulos educativos
  - Teoria e prática sobre circuitos elétricos e eletrônicos
  - Metodologia de ensino e de aprendizagem por indagação
  - Laboratório remoto: VISIR

# Educational Modules for Electric and Electronic Circuits Theory and Practice following an Enquiry-based Teaching and Learning Methodology supported by VISIR

Kick-Off Meeting (KOM), Karlskrona, Sweden, 1-3 February 2016

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

# Project Consortium

# Project Consortium


uarez Bento da Silva
rofessor Idealizadro do Projeto

# Work Packages [name]

## WP1 [**Preparation**]

1st training action

Installing VISIR in all LA HEIs, plus local workshops for training technical staff in VISIR configuration issues.

## WP2 [**Development**]

2nd and 3rd training actions

The educational modules development

1st midterm checkpoint (TAEE'16)

## WP3 [**Quality monitoring**]

Data collection and analysis of learning gains

2nd midterm checkpoint (EDUCON'17)

## WP4 [**Dissemination**]

Local and regional dissemination & exploitation

## WP5 [**Management**]

KOM

Pool of missions allocated to the project coordinator

Final project meeting

# Budget (per cost category)

| | Actual costs | | Unit costs | | | |
|---|---|---|---|---|---|---|
| Cost category | Equipment | Sub-contracting | Travel | Per diem | Staff | Total |
| VISIR+ budget | € 195.000,00 | € 5.000,00 | € 118.990,00 | € 84.000,00 | € 265.068,00 | € 668.058,00 |
| Percentage | 29,2% | 0,7% | 30,4% | | 39,7% | 100% |
| Ceiling | 30% of total grant | 10% of total grant | | | 40% of total grant | |

# Project outcomes

## Work Package 1

- Number of local and remote participants in TA1 + satisfaction questionnaires
- Number of local participants in technical workshops run by BTH elements, at each one of the LA HEIs +
- URL of each installed system

## Work package 2

- Number of local and remote participants in TA2 and TA3 + satisfaction questionnaires
- Enriched course curricula, lessons plans, contents of the courses LMS pages

## Work Package 3

- Results of each pedagogical implementation using VISIR
- To be discussed in detail tomorrow!

## Work package 4

- Number of aggregated institutions (associated partners is a 1st step towards)
- Number of news appearing on media, number of scientific publications, seminars, etc.
- Also to be discussed in detail tomorrow!

# Associated partners

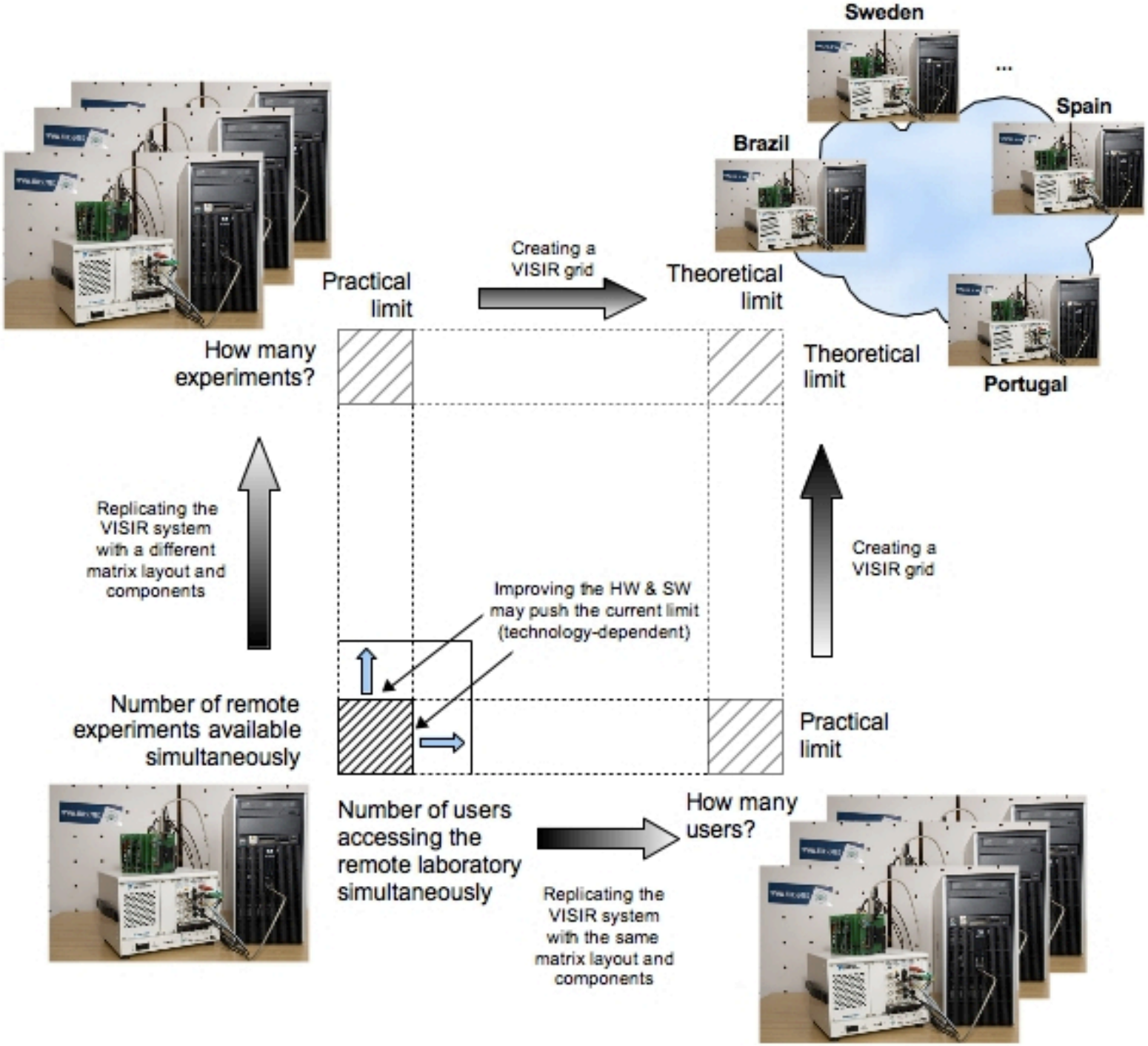
| Ref. | Name of organisation | Type of institution | City | Country | Associated with |
|---|---|---|---|---|---|
| A1 | Instituto Federal Catarinense - IFC | Secondary and Tertiary Education | Blumenau | Brazil | IFSC |
| A2 | Universidade Do Estado de Santa Catarina - UDESC | Higher Education | Joinville | Brazil | IFSC |
| A3 | Instituto Federal Catarinense - Campus Sombrio | Secondary and Tertiary Education | Campo Sombrio | Brazil | UFSC |
| A4 | SATC - Associação Beneficente da Indústria Carbonífera de Santa Catarina | Professional, Primary, Secondary and Tertiary Education | Criciuma | Brazil | UFSC |
| A5 | Universidade do Estado do Rio de Janeiro - UERJ | Higher Education | Rio de Janeiro | Brazil | PUC-Rio |
| A6 | Centro Federal de Educação Tecnológica Celso Suckow da Fonseca (CEFET-RJ) | Professional Education | Rio de Janeiro | Brazil | PUC-Rio |
| A7 | Instituto Politécnico Superior “Gral. San Martín” (IPS) | Secondary and Tertiary Education | Rosario | Argentina | UNR |
| A8 | Facultad Regional Rosario – Universidad Tecnológica Nacional (UTN FRRO) | Higher Education | Rosario | Argentina | UNR |
| A9 | Escuela Técnica Nº 8 | Secondary Education | Santiago del Estero | Argentina | UNSE |
| A10 | Universidad Católica de Santiago del Estero | Higher Education (Private) | Santiago del Estero | Argentina | UNSE |

# … e ao PILAR

- Uma segunda proposta dedicada à criação de uma federação de laboratórios remotos VISIR tem vindo a ser desenvolvida desde 2014.
- Submetida em 2014, 2015, e 2016, foi recentemente selecionada (Julho) pela Agência Espanhola do programa Erasmus+
- Esta primeira rede federada de laboratórios remotos visa o seguinte mote:

Uma experiência para todos os alunos

Todas as experiências para um aluno


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

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P.PORTO

VISIR+

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## Obrigado pela atenção

## Dúvidas e questões?

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# SD - Sessão Dirigida 01

LABORATÓRIOS REMOTOS NO ENSINO DE ENGENHARIA

Coordenador: Gustavo Ribeiro Alves – IPP/ISEP – Porto/PT

Relator: Juarez Bento da Silva – UFSC

Dia 28 Setembro – quarta-feira – 14:30 - 17:30

Auditório: Pitomba