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Federation of remote labs, the PILAR approach

**Platform Integration of Laboratories based
on the Architecture of visiR – PILAR**

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Erasmus+ - Strategic Partnerships for Higher Education



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Contents

1 – VISIR System

2 – VISIR Institutions

3 – System Usage

4 – Pilar Approach

5 – Development

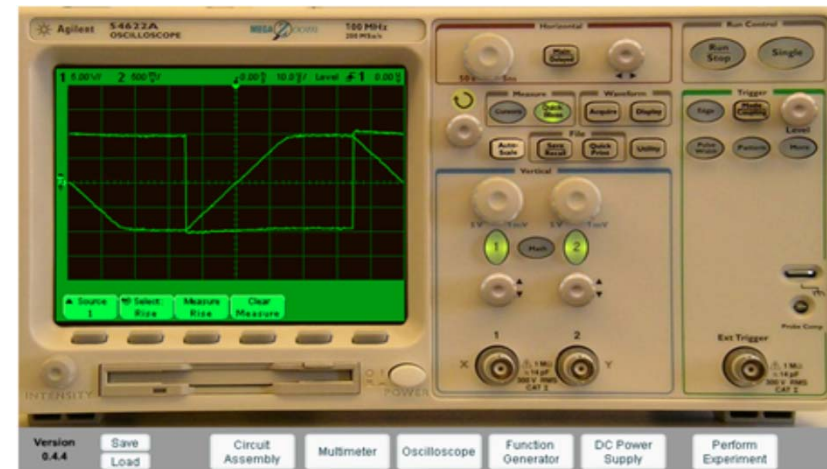
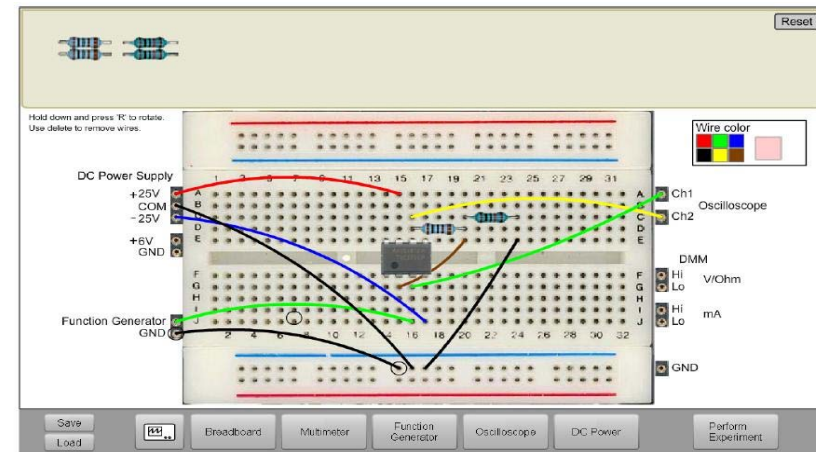


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1. VISIR System

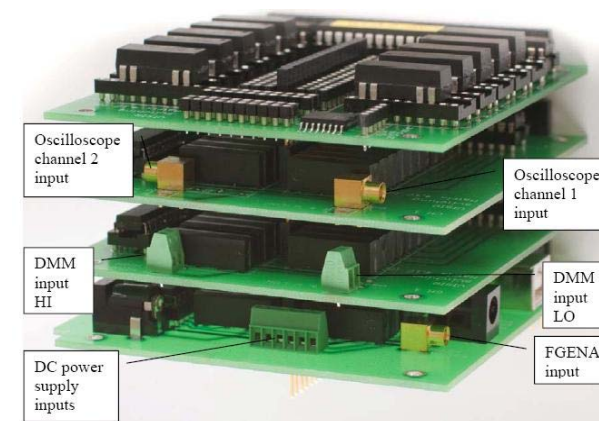
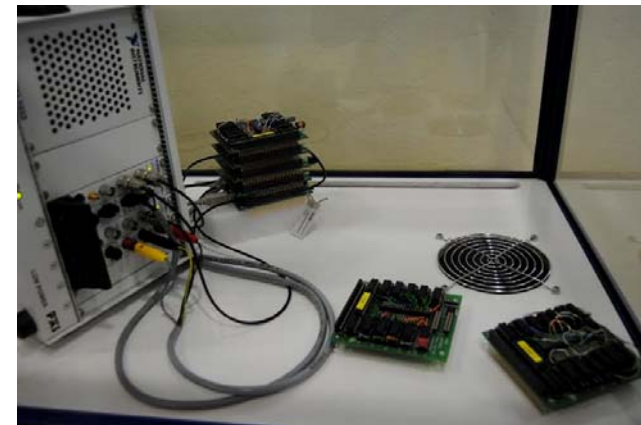
- Open Remote Laboratory
- Directed to Electrical and Electronics Experiments
- Developed at BTH (Blekinge Institute of Technology)
- Launched in 2006





1. VISIR System

- Uses PXI instrumentation by National Instruments
 - Function generator
 - Oscilloscope
 - Digital multimeter
 - Triple output power supply
- Switching Matrix
 - Componente Boards
 - Instrument Boards
- Realistic Interface





2. VISIR Intitutions

- Institutions within PILAR
 - BTH (since 2006)
 - UNED (since 2008)
 - CUAS (since 2008)
 - U Deusto (since 2009)
 - IPP (since 2010)
- Institutions outside PILAR
 - PUC-Rio (since 2016)
 - FW Wien, UFSC, IFSC, UNR, UNSE, Georgia, India





3. VISIR Usage

- Number of Users

Partner	Users	Teachers	Institutions
BTH	less than 100	less than 10	less than 5
UNED	1000 or more	less than 10	less than 5
CUAS	less than 100	less than 10	less than 5
UDeusto	1000 or more	less than 10	20 or more
ISEP/IPP	1000 or more	10 - 49	5 to 9



2. VISIR Institutions

- Localization, i.e. Languages

Partner	EN	SV	ES	PT	DE	PL	NL	AR	Other
BTH	X	X		X			X		EL More...
UNED	X		X	X	X		X		
CUAS	X				X				
UDeusto	X		X	X	X	X	X	X	RO, SL, CZ, RU
ISEP/IPP	X	X	X	X		X	X	X	EL, KU



3. VISIR Usage

- Login Methodology

Partner	Original	LDAP	Other	Guest Login
BTH	1	1	No	Yes
UNED	0	0	JSON	No
CUAS	0	0	GOLAB	Yes
UDeusto	0	2	No	Yes
ISEP/IPP	2	1	No	Yes



3. VISIR Usage

- Electrical Experiments

Partner	Active Filters	Passive Filters	Ohm and KCL (DC)	Ohm and KCL (AC)
BTH	Active	Active	Active	Active
UNED	Active	Active	Active	Active
CUAS	Past	Never	Active	Past
UDeusto	Never	Active	Active	Active
ISEP/IPP	Past	Active	Active	Past



3. VISIR Usage

- Electronics Experiments

Partner	Diodes	Transistors	Ampops	Logic
BTH	Active	Active	Active	Past
UNED	Active	Active	Active	Active
CUAS	Active	Past	Past	Past
UDeusto	Active	Active	Active	Never
ISEP/IPP	Active	Active	Active	Never



3. VISIR Usage

- Other Experiments
 - Thevenin (Black Box)
 - RL time constant
 - Zener
 - RLC
 - DC-DC converters
 - Temperature Dependency
 - Power Dissipation



4. PILAR Approach – What is it?

- Platform Integration of Laboratories based on the Architecture of visIR – PILAR
- ERASMUS+ European Project
- KA2 - Cooperation for Innovation and the Exchange of Good Practices - Strategic Partnerships for higher education



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4. PILAR Approach – What is it?

Partners:

Universidad Nacional de Educacion a Distancia (UNED)

Blekinge Tekniska Hogskola (BTH)

International Association of Online Engineering (IAOE)

Universidad de la Iglesia de Deusto

Instituto Politecnico do Porto (IPP)

Espoon Seudun Koulutuskuntayhtyma OMNIA

EVM project management experts sl

Fachhochschule Karnten-Gemeinnutzi (CUAS)



4. PILAR Approach – Who Needs it?

- Many different stakeholders, including:
 - high schools
 - universities
 - other education institutionsthat need to increase their competences in electronics through real remote electronics experiments covering from simple to sophisticated experiments
- Specifically students and teachers of these institutions that need to increase their practical competences without the problems associated with the maintenance and physical restrictions of real electronics laboratories.
- Curricular development, interinstitutional co-operation, virtual mobility of students and academic staff, and integrated programmes of study, training and research.



4. PILAR Approach - Main Activities

- Building an integrated platform of all the remote VISIR implementations in CUAS, UNED, IPP, UDEUSTO and BTH, that will be accessed as a federation of remote labs
- Building of a set of remote VISIR electric and electronics practices, at different complexities, served as Internet services
- Creation of a set of formal documentation for entering PILAR for use of teachers and universities and schools managements
- Use of all these services in the partners institutions
- Offering to other institutions at local, regional, national and European levels.



4. PILAR Approach - Advantages

A1

- Larger set of practices
- More efficient and effective use of the VISIR resources
- Support for each of the remote lab services offered
- Innovative practical part of subjects
- Better control of the students' learning process

Diapositiva 16

- A1** A much larger set of practices, oriented to different and tuned needs, for students in different academic levels at the school and at the university
- 2- A much more efficient and effective use of the VISIR resources of each of the partners, thanks to the transparent work-balance of users and experiments provided by the federation. The federation of remote labs also will make simple to add new experiments to PILAR becoming it in an easily scalable and maintainable platform
- 3- A service level agreement (SLA) type for each of the remote lab services offered
- 4- A much more innovative practical part of subjects related with electronics at high school and grade and master university levels, more flexible and reliable environment, specially taking into account the troubles faced by many students related with the need of moving to where the laboratories are.
- 5- A much better control of the students' learning process when they carry out real practices on electrical and electronics experiments through the remote laboratories provided by PILAR.

Andre; 07/11/2017



4. PILAR Approach - Characteristics

- 1. Scalability.
 - The VISIR system supports around 50 users at the same time
 - Circuits can be replicated in different VISIR nodes
- 2. Reliability and availability.
 - Redundancy
 - Transparency
- 3. Set of experiments.
 - VISIR is a REAL remote lab
 - User will access the total set of experiments of all the VISIR nodes.
- 4. Tracking system.
 - How many users are accessing each VISIR node
 - Balancing and priorities



4. PILAR Approach - Evaluation Points

- Number of available and federated VISIR platforms in PILAR
- Number of accessible experiments through PILAR
- Number of training courses offered in PILAR for different educational levels
- Number of students involved in training courses
- Number of institutions out of PILAR consortium that will access VISIR
- Number of institutions from countries out of the PILAR consortium scope
- Number of subjects in which PILAR outcomes will be used in regular courses
- Opinions and considerations gathered from surveys
- Support materials and documentation adequacy



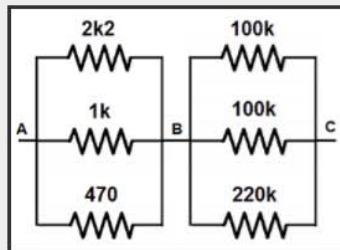
5. Development – Ongoing Steps

- Technical Specs for Federation
- Cross User Policies
- Federation Policies on Availability
- System Data Sharing
- Experiment Listing
- Experiment Pedagogical Documentation

5. Development – Guide Examples

Roteiro da Experiência

Paralelos	Resistências (Ω)		
Paralelo AB	2k2	1k	470
Paralelo BC	100k	100k	220k



- Observe os valores das resistências ao posicionar o mouse por cima, e confirme utilizando o multímetro digital;
- A imagem ao lado representa o circuito completo. Teste os diferentes tipos de associações possíveis e confira o valor da resistência equivalente em cada situação, utilizando o multímetro digital;
- Experimente criar associações em série, em paralelas e mistas com diferentes valores de resistências, e confira com os resultados esperados da solução.
- **ATENÇÃO:** Ao montar o circuito, sempre respeite a imagem e a tabela ao lado que indica quais resistências podem ser ligadas em paralelo. As resistências em paralelo na imagem podem ser ligadas em série, desde que sejam apenas duas.
- Exemplo: Pode-se ligar as resistências 2k2 e 1k em paralelo, e em série com a de 100k. Não será possível ligar a resistência de 1k em paralelo com a de 100k, neste caso, o sistema anunciará um erro.

[Confira a solução dessa experiência aqui](#)

5. Development – Teacher Interface

The screenshot displays the VISIR+ Teacher Interface. At the top left is the VISIR+ logo, and at the top right is a 'Menu' button. Below the header, a text line reads: 'avaliará o circuito e criará sua Max List (se possível) e implementará no sistema do VISIR.'

The main content area is divided into two sections:

- Formulário (Form):** A blue-bordered form with a title bar containing a circuit board icon. It includes:
 - Nome:** A text input field.
 - E-mail:** A text input field.
 - Imagem do Circuito:** A section with an 'Escolher arquivo' button and the text 'Nenhum arquivo selecionado'.
 - Descrição do Circuito:** A large text area for description.
 - Buttons for 'Enviar' (Send) and 'Limpar' (Clear).
- Component List:** A table with a search bar at the top. The table has three columns: ID, Valor, and Nós. It lists various components like Condensador, Diodo, F. Gen, Fonte CC, and Indutor. Below the table is a pagination control with 'Previous', '1', '2', '3', '4', '5', and 'Next' buttons.

The footer contains navigation links: 'Home · Experiências · Professor · Administrador · Contato · VISIR'. Below the footer is a disclaimer: 'This project has been funded with support from the European Commission. This website reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein'. The year '2017' is also visible.



5. Development – Max Lists

*Instrument card

VFGENA_FGENA1 A 0 max:5

VDC+6V_3 A vmax:6 imax:0.5

VDC+25V_24_4:1_7 E vmax:10 imax:0.5

*CompBoard1

R_R11 C 0 4.7k

SHORTCUT_1_2 D E

*CompBoard4

R_R1 A B 470

R_R2 C D 470

D_D1 A B 1N4148

D_D2 C D 1N4148

C_C1 B C 220u

C_C2 B C 56n

SHORTCUT_1 B C

SHORTCUT_2 D 0

SHORTCUT_3 C D

SHORTCUT_4 B 0

SHORTCUT_5 C 0

*CompBoard6

R_R10 A B 100

BLACKBOX4_1 0 C D A 1

*CompBoard5

L_L1 A B 680u

C_C3 B C 100n

R_R3 B C 180

R_R4 B C 100

R_R5 B C 27

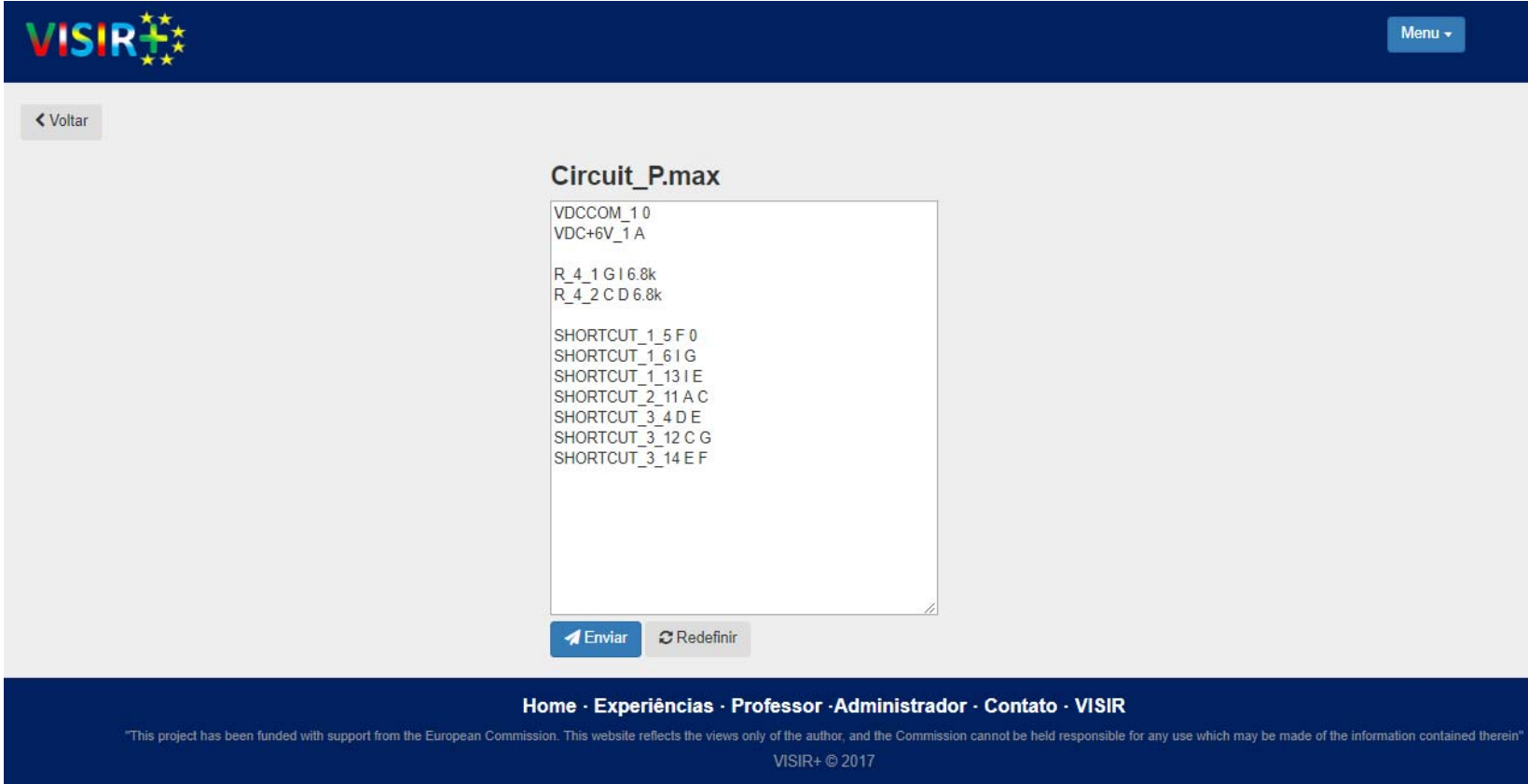
R_R6 C D 10k

R_R7 C D 4.7k

R_R8 C D 1k

R_R9 A B 1k

5. Development – Maxlist Editor



The screenshot displays the Maxlist Editor interface. At the top left is the VISIR+ logo, and at the top right is a 'Menu' button. Below the header, there is a '< Voltar' button. The main content area is titled 'Circuit_P.max' and contains a list of circuit components:

```
VDCCOM_1 0
VDC+6V_1 A

R_4_1 G I 6.8k
R_4_2 C D 6.8k












SHORTCUT_1_5 F 0
SHORTCUT_1_6 I G
SHORTCUT_1_13 I E
SHORTCUT_2_11 A C
SHORTCUT_3_4 D E
SHORTCUT_3_12 C G
SHORTCUT_3_14 E F
```

At the bottom of the component list, there are two buttons: 'Enviar' and 'Redefinir'.

At the bottom of the page, there is a navigation menu: Home · Experiências · Professor · Administrador · Contato · VISIR. Below the navigation menu, there is a disclaimer: "This project has been funded with support from the European Commission. This website reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein". At the very bottom, there is a copyright notice: VISIR+ © 2017.

5. Development – Maxlist Management

Max Lists  

Circuit_P.max	 	Circuit_S.max	 
EXP_1.max	 	Exp_2.max	 
TA_circuit_1.max	 	TA_circuit_2_RCL.max	 
TA_circuit_2_RLC.max	 	TA_circuit_3_a.max	 
TA_circuit_3_b.max	 	TA_circuit_4.max	 
TA_circuit_5.max	 	TA_demo1.max	 
TA_demo2.max	 	cap_ind_RLCserie.max	 
circ_1_mvb.max	 	circ_2_mvb.max	 
circ_3_mvb.max	 	circ_4_mvb.max	 
diodo_1_funcionamento.max	 		

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5. Development - Contact



The image shows a screenshot of a web application's contact form. At the top left is the VISIR+ logo, and at the top right is a 'Menu' dropdown. The form itself is titled 'Formulário de Contato' and contains the following fields: 'Nome' (text input), 'E-mail' (text input), 'Mensagem' (text area), and 'Destinatário' (dropdown menu with 'Escolher' selected). Below the form are two buttons: 'Enviar' (blue) and 'Limpar' (grey). The footer contains a navigation menu with links to 'Home', 'Experiências', 'Professor', 'Administrador', 'Contato', and 'VISIR', along with a disclaimer and copyright information.

Formulário de Contato

Nome:

E-mail:

Mensagem:

Destinatário:

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**Thank you for your
attendance!**

P. PORTO



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