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

**PROJECT
Number:2016-1-
ES01-KA203-
025327 Erasmus+
- Strategic
Partnerships for
Higher Education**

Authors:

Manuel Castro, Felix Garcia, UNED

André Fidalgo, Gustavo Alves, Arcelina Marques, Natércia Lima, IPP





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List of Acronyms

BTH	Blekinge Institute of Technology
CUAS	Carinthia University of Applied Sciences
IO	Intellectual Output
IPP-ISEP	School of Engineering – Polytechnic of Porto
MoUs	Memory of Understandings
OER	Open Educational Resource
PILAR	Platform Integration of Laboratories based on the Architecture of visiR
RL	Remote Laboratory
RL	Remote Laboratory
SLA	Service Level Agreement
UNED	Spanish University for Distance Education
VF	VISIR Federation
VISIR	Virtual Instrument System In Reality
WP	Work Package



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1. Objective

This document is a description of the changes in the project structure according to the meeting held with the Spanish Agency - Erasmus+ in May 2018. The aim of this document is to establish the redesigned structure in which the VISIR federation (VF) will be developed.



2. Background

The methodology and work plan applied for PILAR was based on a structure of work packages in order to clearly define what activities should take place when and relate them to the outputs presented.

A suggested list of Work Plan with Work Packages (WP), Tasks and Intellectual Outputs related to each WP as well as overall view of the interaction and general view of the project and WPs is represented in **Figure 1**.

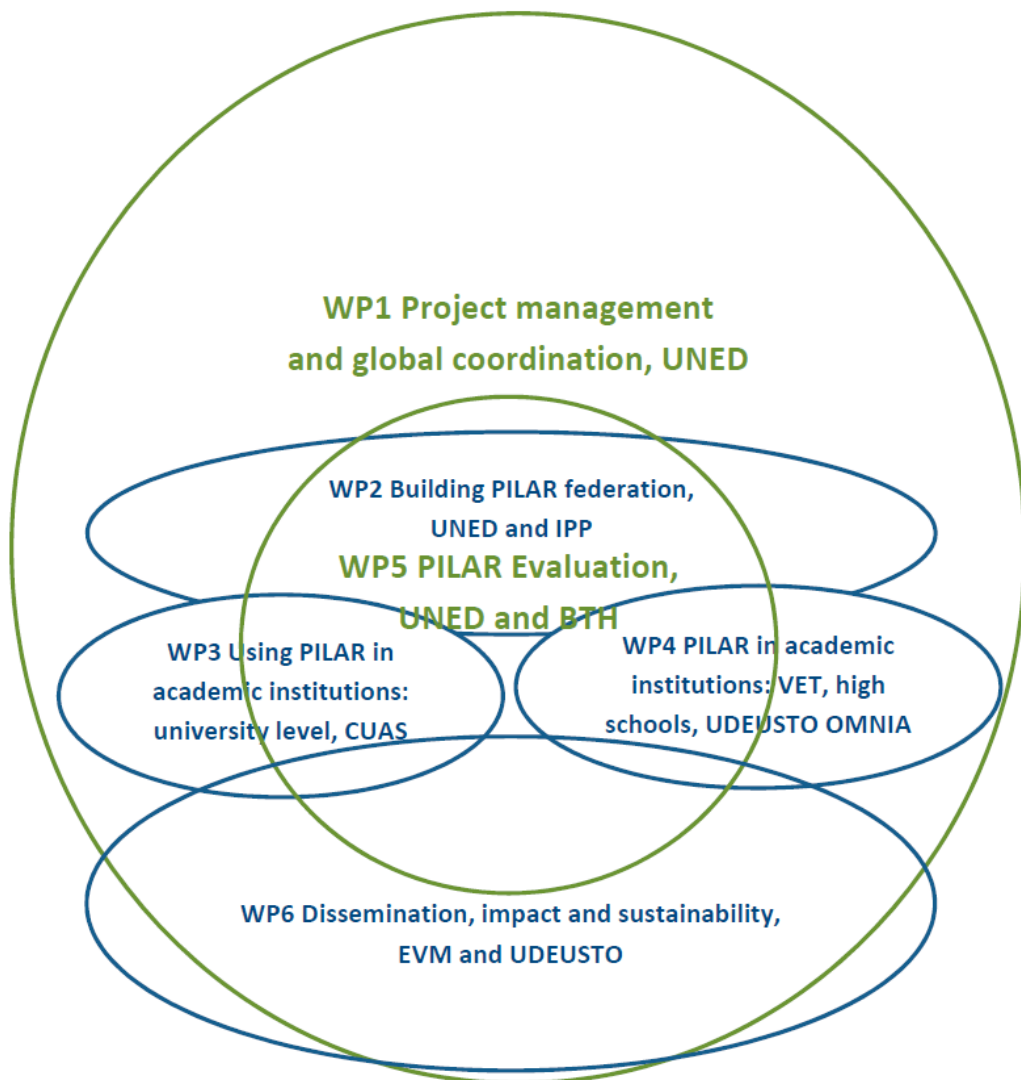


Figure 1. Original general view of the project.

Besides the programmed activities within the project, some activities were accomplished by the partnership before the beginning of the project, in order to have a more efficient management of time and to simplify the management of the implementation activities. These activities were established to consolidate the sharing of all the updated knowledge (about technical improvements and learning experiences), setting the starting point of the project, in



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order to provide a better federated platform, easier to use, with more experiments, more efficient, reliable and effective, thanks to the sharing and federation of all the functionalities provided by each partner of PILAR.



3. PILAR Work Packages

3.1. WP1: Project management and global coordination

Leading institution: UNED

Project Management and implementation activities related: A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12.

- **Task 1.1:** Ensuring administrative tasks and resource management (contracts, reports, payments)
 - Chairing project meetings and ensure follow-through of decisions
 - Maintaining and monitoring the work of the project, including performing the appropriate quality control on project deliverables.
 - Identifying and troubleshooting, any technical or organizational problem, and report to partners on variance
 - Handling conflict resolution procedures
 - Interfacing with the National Agency
 - Reporting to the National Agency in accordance with the Grant Agreement
 - Organisation of project meetings
 - Ensure follow-through of decisions at project meetings.
 - Organisation of any other meeting among project partners which might be considered necessary, over the duration of the project, to implement the project work programme
 - Organize for effective internal communication among partners
 - Make tools for internal communication available for all partners, project mailing list, documents archive, and net-based video conferencing facility
- **Task 1.2:** Building and implementing a Project Management Center (PMC). The PMC will consist of a server-based interactive system, configured with preliminary designed working scenarios for managing the project. The PMC will maintain the defined working scenarios. Also, the defined templates for the connection to the PILAR federation will be maintained and updated in this PMC. An e-working server enabling the use of procedures and templates with online control possibilities is part of the PMC.
- **Task 1.3:** Organize all the Partner's Meetings

3.2. WP2: Building PILAR federation

Leading institution: IPP

Intellectual Outputs related: O1, O2, O3, O5 y O6

- **Task 2.1:** VISIR's state of art
- **Task 2.2:** Technical building of availability, reliability and balance details of the federation
- **Task 2.3:** PILAR set of remote services for electrical and electronics practices
- **Task 2.4:** First technical pilot of federation features
- **Task 2.5:** Documentation of federation policies for users and partners



3.3. WP3: Using PILAR in academic institutions: university level

Leading institutions: CUAS and IAOE

Intellectual Outputs related: O4, O5, O6

- **Task 3.1:** Selection of old and new subjects where PILAR will be used at partners
- **Task 3.2:** Integration of PILAR in subjects at grade and master levels
- **Task 3.2:** Pilots in partner institutions
- **Task 3.3:** Pilots in other interested stakeholders at university level

3.4. WP4: Using PILAR in academic institutions: high schools

Leading institutions: UDEUSTO and OMNIA

Intellectual Outputs related: O4, O5, O6

- **Task 4.1:** Selection of high schools interested in PILAR
- **Task 4.2:** Selection of subjects where PILAR will be used
- **Task 4.3:** Pilots in high schools

3.5. WP5: PILAR Evaluation

Leading institution: BTH

Intellectual Outputs related: O7

- **Task 5.1:** Building the evaluation plan, with qualitative and quantitative performance indicators, both for technical and pedagogical goals
- **Task 5.2:** Evaluation of technical details for PILAR
- **Task 5.3:** Evaluation of pedagogical details at university level
- **Task 5.4:** Evaluation of pedagogical details at high school level
- **Task 5.5:** Evaluation of dissemination activities
- **Task 5.6:** Global evaluation report

3.6. WP6: Dissemination, impact and sustainability

Leading institutions: EVM and UDEUSTO

Intellectual Outputs related: O8

- **Task 6.1:** Dissemination plan
- **Task 6.2:** Organization and delivery of multiplier events in European conferences
- **Task 6.3:** Organization of training activities
- **Task 6.4:** Activities for contacting with other stakeholders
- **Task 6.5:** VISIR Alliance



4. Intellectual Outputs

Throughout the project, a number of technical and pedagogical actions were defined to be carried out aiming at the VF of integrated systems.

Project activities are structured in 8 main Intellectual Outputs as follows:

- VISIR Alliance
- Advances in VISIR's state of the art
- VF policies
- Results on PILAR pilot
- Set of open remote VISIR electrical and electronics practices
- PILAR set of technical and methodological documentation
- Evaluation plan and evaluation results analysis
- Dissemination outcomes

4.1. Visir Alliance

- **Leader:** Instituto Politecnico do Porto.
- **Description:** This Intellectual Output will work in the consolidation of the existing informal group of VISIR systems within the new VISIR Alliance, which involves the highest level of representatives of the partner institutions that will be the core of the future sustainable environment within the project.
- **Activities:** The activities foreseen are:
 - Publication on the PILAR website of all the necessary information, including all the administrative and educational details of the Alliance, linking the administration of the different partners with the results of the project
 - Compilation, structuring, and publication on the PILAR website of the details of the courses and experiments served from PILAR in each institution.

4.2. Advances in Visir's State of the Art

- **Leader:** UNED.
- **Description:** The objective is to create a document stating the VISIR state of the art previous to the PILAR project and the different advances that PILAR will implement. The document will do a complete analysis of VISIR and how PILAR will innovate from the technical and pedagogical points of view. The document will describe the different types of practices and suitable training levels and how to connect PILAR and implement the practices.
- **Activities:** There will be 2 activities to develop this Output:
 - Technical analysis and usage
 - Description of all the technical (hardware and software) details of its VISIR node at present.
 - A detailed description of all the different experiments available from its VISIR node.



- Description of the grade level of the students currently using VISIR in higher and secondary education.
- Catalog of experiments and practices, including the following sections:
 - A detailed catalog of practices offered by the partners,
 - Proposals to technically improve the different VISIR nodes of the federation,
 - New experiments that complement the initial catalogue and,
 - New and more pedagogical practices for the different educational levels of potential students.

4.3. Visir Federation Policies

- **Leader:** CUAS.
- **Description:** The objective is to create a document containing the policies on how to become a user of the VISIR federation, both as a supplier and a user after reaching all partners an agreement on the procedures. It will describe the technical details for connecting to PILAR as a member of the project. It will specify as well the technical needs of any institution interested in the use of PILAR as a tool for implementing electronics practices, at secondary and higher education levels.
- **Activities:** This intellectual output will be developed with the following activities:
 - Description of the technical details for connecting to PILAR.
 - Definition of details and technical needs for the different levels of access: user, teacher, node administrator, and federation administrator.
 - Determination of the different concurrent activities allowed in the federation.

4.4. Results on Pilar Pilot

- **Leader:** IA OE.
- **Description:** The objective of this output is to produce a report with the results of the first PILAR federation pilot. The document will be created by a team composed of at least a teacher and a technician from all the involved universities, led by IA OE.
- **Activities:** The Activities foreseen to complete this output and achieve the objectives are:
 - Technical details of the communication, hardware and software levels of the federation.
 - Didactical details of the tested electronics practices and the number of experiments.
 - User details on how to connect to this first version of the federation.

4.5. Set of Open Remote Visir Electrical and Electronics Practices

- **Leader:** Instituto Politecnico do Porto.
- **Description:** The objective of this output is building at least 5 different services that will offer a number of transparent, highly available electronics practices, from different partners. These services will be seen through PILAR, obscuring all the complexities of the different levels of communication related with the 5 VISIR nodes in the federation.



These services will be available as a “closed” service, once identified in the federation. The services will be highly reliable, offering the same almost real-time capabilities as the usual VISIR one node services. They will be used freely by using only a web browser and an Internet connection.

- **Activities:** To this end, two key activities have been identified:
 - Identification of the services to be developed.
 - Implementation and development of such services.

4.6. **Pilar Set of Technical and Methodological Documentation**

- **Leader:** BTH.
- **Description:** The aim of this intellectual output is to develop and establish formal definitions of procedures, learning and training methodologies and documentation creation in order to precisely define how to integrate all experiments into a common federation. Each organization will cooperate with its experience and past results in order to define this common development and integration methodology.
- **Activities:** The actions identified under this IO are as follows
 - Technical documentation, showing how to integrate all the previous available experiments in VISIR and the new ones into a common federation. This documentation will define the details of the technical procedures on how to connect, from the technical point of view to the PILAR federation.
 - Methodological documentation, showing the learning and training details that can be accessed through PILAR. Each experiment will be described, showing their components, their complexities and possible complications, as well as the level required for their completion.

4.7. **Evaluation Plan and Evaluation Results Analysis**

- **Leader:** BTH
- **Description:** This IO is intended to comply with the Analysis of the results of the final evaluation and the evaluation plan during the project. An evaluation strategy will be designed which will define key terms, stakeholders, aims of the evaluation as well as the evaluation criteria, along with the most suited techniques for data collection and analysis. The evaluation plan shall include a complete analysis, from both technical and pedagogical points of view, of all the collected results.
- **Activities:** The following activities have been foreseen to develop this IO:
 - Building the evaluation plan, with qualitative and quantitative performance indicators, both for technical and pedagogical goals.
 - Evaluation of technical details for PILAR.
 - Evaluation of pedagogical details at university and secondary education levels
 - Overall evaluation report.

4.8. **Dissemination Outcomes**

- **Leader:**EVM



- **Description:** The objective of this IO is to disseminate the project and its results, as well as to guarantee the greatest possible impact among the potential public and relevant actors. To ensure an effective dissemination of the project results several actions will be performed during the project, highlighting the following: development of the project website; workshops; attendance to conferences and events; creation of promotional materials such as brochures.
- **Activities:** To achieve the objectives of this IO, two activities are contemplated:
 - Development and implementation of the project website.
 - Dissemination strategy and plan.

5. New Structure for the PILAR Project

According to the guidelines provided by the Spanish National Agency - Erasmus+ during the meeting held in May 2018, the project structure, based on WP, and outcomes, based on IOs, required a redesign and a restructuration. Therefore, following the recommendations provided by the Spanish National Agency - Erasmus+, WPs organization were no longer considered and the development of the project has been divided into two main phases highly differentiated:

- Pilot development phase (01/09/2016 ↔ 30/04/2018)
- Exploitation and outputs phase (01/05/2018 ↔ 31/10/2019)

About the management structure for the PILAR project, it was designed to ensure the good organization of the project by monitoring that the goals are clearly defined and understood, and that responsibilities are clearly assigned between partners. The management structure has not been basically altered due to the Spanish National Agency recommendations, although several topics were affected by the redefinition of the project structure. However, these alterations have not modified the first phase of the project (pilot phase).

The main decision body in PILAR is the General Assembly, GA. All the process to handle information flow and decisions has been established in a transparent way. All the structurization process has been reshaped by all the partners (management, technical and educational aspects) and formally defined in GA meetings.

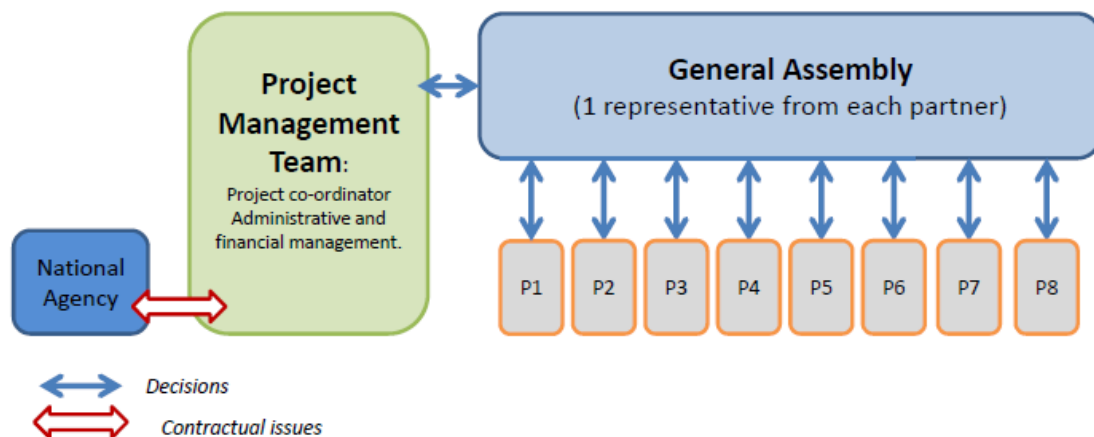


Figure 2. PILAR management structure.

5.1. PILAR Pilot phase

5.1.1. Dates

Start date (DD/MM/YYYY): 01/09/2016.

End date (DD/MM/YYYY): 30/04/2018.

Duration: 20 months.

5.1.2. Description

This phase covers all the activities which must drive into the pilot of the federation.



During this phase, the VF architecture must be defined and established by all the partners in order to launch a pilot stage, especially those VISIR provider partners as OER providers in the project. The five different VISIR remote laboratories (RLs) instances are the starting point for the VF. Each VISIR provider partner has implemented different settings for management and access, which is relevant for the design of the PILAR lesson repository architecture:

- UNED: the VISIR system is managed through a software called WebLab-Deusto. However, on top of that, UNED uses a proprietary reservations component that guarantees that in some cases, only one person at a time can access the VISIR system and the rest of the time, up to 60 concurrent students access the system. This reservations component supports the IMS LTI protocol.
- ISEP IPP: the VISIR system was originally managed through the OpenLabs software that used to come with VISIR. However, in March 2018, ISEP with UNED deployed a new VISIR system in ISEP which used WebLab-Deusto for managing users.
- University of Deusto: the VISIR system in the University of Deusto uses WebLab-Deusto for managing the access to the VISIR laboratory.
- BTH: BTH uses OpenLabs software (which used to come with VISIR) to manage its VISIR system.
- CUAS: The Carinthian University of Applied Sciences owns a VISIR system which relies on a custom software called e-dispatcher.

5.1.3. Requirements

The established requirements for the VF are:

- Enable the access of teachers and students to all the PILAR VISIR systems.
- The solution must be federated, meaning that teachers and students will not need to be registered in each of the VISIR systems of the PILAR consortium.
- Students and teachers do not need to be aware of which VISIR system they are using. They should be able to move from one system to another without knowing what VISIR system supports what.
- Teachers must be able to try the lessons without having their own infrastructure.
- Teachers must be able to use the contents without having their own infrastructure.
- Students and teachers that participate in the pilot course must have a real and reliable, accessible through Internet, PILAR workbench for doing electrical and electronics practices.

5.1.4. Objectives

The objectives pursued by PILAR consortium at the end of the pilot phase are:

- Based on the different implementations, described in section 5.1.2 Description, of the VISIR systems involved in the federation, to build a reliable, highly available, unique international VF platform.
- The VF platform must integrate different Open Educational Resources (OERs) based on VISIR Remote Lab (RL) and provided by each of the VISIR provider partners, that will be offered as RL services to students.



- These new VISIR RL Internet services must be provided in a transparent way for teachers and students.
- A well-defined subset of open remote VISIR practices, available on the Internet through VF as a set of SLA-controlled services.
- The VF platform must allow a much better control of the students' learning process when students use the VF platform and RL services.
- The VF must provide the required infrastructure to teachers without having their own one in order to exploit OERs based on VISIR RL.

5.1.5. Activities and Tasks

The pilot phase must accomplish the next tasks:

- VISIR Alliance
- PILAR website (project website).
- MoUs (Memory of Understandings).
- RL publications (updated across the project).
- VISIR state of the art.
- VF technical report (pilot phase).
- VISIR RL catalog.
- VF- educational platform.
- PILAR policies (first stage; updated across the project).
- Results of the first PILAR federation pilot.

5.2. PILAR exploitation phase

5.2.1. Dates

Start date (DD/MM/YYYY): 01/05/2018.

End date (DD/MM/YYYY): 31/08/2019.

Duration: 16 months.

5.2.2. Description

This phase covers all the services, formal definitions of procedures, learning and training methodologies provided by the resulting VF. Once finished the pilot phase of the federation, the partners have to define the final framework for the VF. This phase applies a typical "Plan Do Check Act" Deming cycle from the "before the pilot" phase to the final version, passing by different improving cycles throughout the entire life of the project.

5.2.3. Requirements

The following requirements will be covered in the final version of the VF:

- Support of distributed load balancing: if a circuit is available in more than one VISIR system, students should be dynamically redirected to one or the other.



- A new set of remote practices, based in this new platform, for electrical and electronics circuits, designed for different educational levels (school, grade, master, lifelong-learning, etc.).
- Teachers and students must be able to have contents in multiple languages.
- Teachers must be able to have a single repository where to search for lessons and contents.
- Teachers must be able to take the contents and lessons and bring them to their own spaces outside PILAR using an assistant.
- Teachers must be able to use the contents without having their own infrastructure.
- A service level agreement (SLA) type for each of the remote lab services offered.

5.2.4. Objectives

The objectives pursued by PILAR consortium at the end of the pilot phase are:

- A reliable, highly available VF, which integrates all the different VISIR resources, used at each of the VISIR providers.
- VF will be completely opened to other partners in Europe, through easy gateways to the federation, allowing extending the capabilities of PILAR to much more interested educational institutions.
- A much larger set of practices.
- These remote lab services will be provided to students in all the partners' institutions and to anyone interested. The results will bring added value at EU level because the activities can not be attained in a single country.
- These new VISIR RL Internet services must be provided in a transparent way for teachers and students.
- A much more efficient and effective use of VISIR resources.
- The VF must provide the required infrastructure to teachers without having their own one in order to exploit OERs based on VISIR RL.
- A federation web which will serve as a repository and as a mean of spreading the federation.
- The VF platform must allow a much better control of the students' learning process when students use the VF platform and RL services.

5.2.5. Activities and Tasks

- VF services.
- Technical procedures.
- Methodological procedures.
- OER structure.
- Lesson repository web.
- Exploitation phase results.
- Activity results.
- Outcome results.