Report on FInES Cluster Activities

EPES Project

Eco-Process Engineering System For Composition of Services to Optimize Product Life-cycle

FoF-ICT-2011.7.3-285093

Public Project Report

Project Facts:

	Duration:	**36 Months** **(September 2011 – August 2014)**
	Programme:	**FP7 – ICT**
	Website:	**http://www.epes-project.eu**

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Summary

EPES project will develop a novel eco process engineering system, which will constitute a comprehensive platform enabling the dynamic composition of services adaptable to the different products and operating conditions, supporting the Product Service System concept.

This document presents the FInES cluster activities carried on during the first 12 months of EPES project aimed to address the envisaged collaboration activities with other ICT projects from "FP7 – FoF Objective 7.3" under the responsibility of the "Networked Enterprise and RFID" unit and/or "Converged Networks & Services" Directorate. This collaboration will exploit synergies between these projects and will increase the impact of the ICT initiative. The document constitutes an update of the public deliverable *D700.4 Dissemination Strategy and FInES cluster Collaboration Plan* due to month 6.

The document has the following structure. Chapter 1 describes the purpose of this document, its position with respect to the whole EPES project and the approach followed for the collaboration with the projects of the FInES cluster. In Chapter 2, the FInES cluster activities are presented, including a description of the cluster meetings attended by EPES project representatives, the collaboration plans with other related projects expected to exploit the synergies arisen from the cluster meetings, the dissemination materials elaborated so far (new web page, papers, new version of the leaflet, participation to workshops and posters), the participation plans in the task force Manufacturing and Industry, and the coordination of standardization efforts.

Table of Contents

Abbreviations

API	Application Programming Interface
CEN	European Committee for Stand-ardization
DMS	Decision Making System
eBIF	ETV Binary Interchange Format
EC	European Commission
EoL	End-of-Life
ETSI	European Telecommunications Standards Institute
EU	European Union
FInES	Future Internet Enterprise Systems
HTML	Hypertext Mark-up Language (and file extension)
ICT	Information and Communication Technologies
I-ESA	Interoperability for enterprise systems and applications
ISU	International System Unit
KBE	Knowledge Base Engineering
KPI	Key Performance Indicator
OMG	Object Management Group
PLM	Product Lifecycle Management
PSS	Product Service System
RFID	Radio-Frequency Identification
SI	Sustainable Intelligence
SG	Service Generator
SME	Small and Medium-sized Enter-prise
SW	Software
SS	Simulation System
VCN	Virtual Collaborative Networks
VFKB	Virtual Factory Knowledge Base

1   Introduction

The overall idea of the project is to develop a set of tools, which will constitute an eco-process engineering system enabling the manufacturing companies to continuously upgrade their products along their life cycle in close collaboration with key stakeholders as users, maintenance experts, technology providers, experts and researchers, etc. The ICT tools will be surrounded by a methodology supporting the building up of the virtual factory and allowing the migration to the new working paradigm. The process will use knowledge and expertise from different sources that will be captured, stored and reused by means of an EEKB (Eco-process Engineering Knowledge Database). The concept of Life Cycle Thinking (LCT) will be applied, which seeks to identify possible improvements to goods and services in the form of lower environmental impacts and reduced use of resources across all life cycle stages. This begins with raw material extraction and conversion, then manufacture and distribution, through to use and/or consumption. It ends with re-use, recycling of materials, energy recovery and ultimate disposal. The key aim of Life Cycle Thinking is to avoid burden shifting. This means minimizing impacts at one stage of the life cycle or in a particular impact category, while helping to avoid impacts during other life-cycle phases of a product. The system will be formed by four modules as can be seen in the Figure 1:
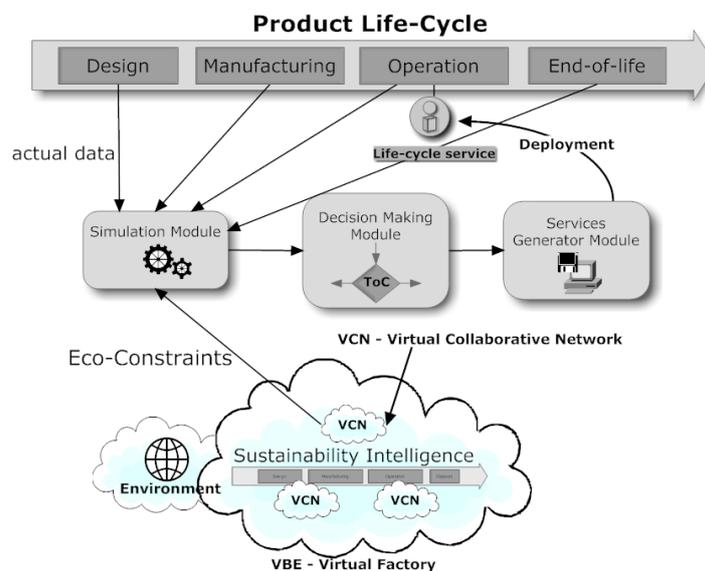
Figure 1. Plan of EPES system functionality.

1.1   Document Purpose

This document explains the FInES cluster activities carried out during the first year of EPES project. The document also provides contributions to the following activities of the 'Future Internet Enterprise Systems' (FInES) cluster:

- Exploitation of synergies / technical 'concentration': participation to workshops, contribution to one of more working groups activities, input to scientific and strategic activities

- Joint activities for exchange, dissemination and training

- Production of dissemination material that can be used for communication towards the general public

- Co-ordination of standardization efforts

- Contribution to repositories of reference and dissemination portals

- Participation in the Task Force Manufacturing and Industry

1.2   Approach applied

EPES consortium partners have been participating in several FInES (Future Internet and Enterprise Systems) cluster meetings. The interaction with the projects that belong to this cluster provided a valuable framework, which enabled the identification of complementarities that leveraged the generation of synergies and fostered the collaboration opportunities.

Future Internet Enterprise Systems (FInES) has emerged as a field of activity that aims at enabling enterprises, including SMEs, by means of ICT, to exploit the full potential of the Future Internet. The FInES vision and research objectives are defined in its Position Paper: *"The full potential of the Future Internet is accessible to, relevant for, and put to use by European enterprises including SMEs. The Internet thus becomes a universal business system on which new values can be created by competing as well as collaborating enterprises - incumbent as well as new - through innovation in a level playing field, with sustainable positive benefits for the economy, society and the environment"*. The FInES community consists of more than 950 stakeholders (users, providers, intermediaries, public authorities, standards organisations and the research community). The Cluster has a strong focus on cross-domain co-operation (web semantics, web content technologies, grids, collaborative environments, service oriented architectures, eGovernment, etc.), whereas natural links with standardisation bodies (CEN's eBIF, ICT Standardisation Study, ETSI, etc) and EU Enterprise policy exist, as well as cooperation with the other Commission Directorates-General. More information about the FInES cluster and its activities can be found through the next link: http://www.fines-cluster.eu

Apart from its portfolio of more than 30 FP7 and FP6 projects (and with 10 more FP7 projects in the "Factories of the Future" recently started, such as EPES project), the Cluster has consolidated high-quality publications and has effectively supported collaboration and liaison activities in various networking events and task forces.

2   FInES Cluster Activities

2.1   FInES cluster meetings

During the first year of EPES project, several FInES Cluster meetings were attended by the project partners. The meeting was held on October 2011 in Brussels and was attended by the software vendor ESTECO[1]. During the meeting, the new 10 FoF (Factories of the Future) projects were presented and general awareness on collaboration opportunities was raised. EPES consortium also participated in the consultation of the FInES Research Roadmap 2025[2], which was published in June 2012 and is available for downloading at the [FInES portal](#).

The second cluster meeting was held in December 2011 in Brussels. It was attended by the project coordinator Tecnalia[3], which prepared a short presentation explaining EPES project. In addition to this, Tecnalia explained the expected outcome of EPES project. In the meeting, the collaboration and liaison activities supported by researchers and projects in the context of the Task Forces[4] of the FInES Cluster were explained.

The Third Cluster meeting was held in March 2012 in Brussels. It was attended by Tecnalia. The objective of the meeting was the exploitation of the previously identified synergies between EPES, PREMANUS, ComVantage and Bivee projects, aiming at increasing the impact of the ICT initiative. The following section explains some exploitable complementarities between EPES and the above mentioned projects.

2.2   Collaboration with other projects

The current collaboration activities with PREMANUS, ComVantage and Bivee "FoF" projects are described in the next sub chapters. The envisaged collaboration is focused on benefiting all by offering an increased opportunity for synergy among research projects and it will increase the impact of the ICT projects from FP7 FoF Objective 7.3.

2.2.1   PREMANUS Project

The goal of PREMANUS[5] is to overcome the asymmetric distribution of information in the End-of-Life (EoL) recovery of products by connecting OEMs and subcontractors, with a special emphasis on remanufacturing. To achieve this goal, PREMANUS will provide an on demand middleware, which combines product information and product services within one service oriented architecture. In addition to closing the information gap, the PREMANUS middleware would compute EoL-specific KPIs based on product usage data and make recommendations to its users regarding the viability (in terms of profitability, scope, and time) of remanufacturing a product.

PREMANUS and EPES exchanged ideas about several complementary topics, such as:

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[1] http://www.esteco.com/
[2] http://www.fines-cluster.eu/fines/jm/news-section/past-news/fines-research-roadmap-2025-v20-consultation.html
[3] http://www.tecnalia.com/en
[4] http://www.fines-cluster.eu/fines/jm/FiNES-Public-Information/cluster-task-forces.html
[5] http://www.premanus.eu/

- The use of common standards, interoperability and compatibility of the platforms, and knowledge and expertise on existing software frameworks that could be reused and extended in the projects

- Collaboration in dissemination: special sessions in Conferences, Workshops, joint presentations, etc

- Sharing and combining metrics (KPIs). Metrics are used in EPES project to track the optimization of a particular process, for instance, the maintenance process carried out by a windmill engineering company in EPES Business Case 1. In PREMANUS project, metrics are used to find out recommendations regarding the viability of remanufacturing a product, for instance, a windmill multiplier (gearbox) in PREMANUS SKF Use Case

- Complementing EPES Business Case 1 and PREMANUS SKF Use Case (see Figure 2) regarding the Maintenance Lifecycle of Complex Products (Wind Turbines). Both Business Cases are complementary, since they belong to the same domain (windmill industry) and to different product life cycle stages. EPES Business focuses on operation (windmill maintenance and upgrades) and PREMANUS SKF Use Case focuses on an adjacent stage, the end-of-life phase of the product (assessment on the remanufacturing of windmill multipliers). In order to establish a sound collaboration framework, the projects are considering the best approach for the integration of the two platforms. A possible connection point between the two Business Cases is described below:
    - EPES maintenance process collects technical data about windmills usage to determine the gearboxes status
    - Based on predictive calculations on when a windmill requires maintenance (gearbox replacement or remanufacturing), EPES platform contacts PREMANUS remanufacturing process in order to obtain the gearbox remanufacturing availability in time and price
    - Finally, EPES maintenance process schedules the planning of maintenance tasks taking into consideration PREMANUS remanufacturing process outputs, which help determining whether a gearbox replacement is more suitable that a gearbox remanufacturing or vice versa

Figure 2. Maintenance Lifecycle of a windmill

- The collaboration between the projects will result in:

    o Sharing and combining KPIs, such as:

        ▪ Wear of product

        ▪ Costs of remanufacturing = costs of maintenance

- ▪ Duration of remanufacturing = Time for pre-order / maintenance

- ▪ Technical and economical availability

  - o Connecting the Business Processes:

    - ▪ EPES predictive analytics and PREMANUS Decision Support could operate on the same data basis

      - • Information on wear of the product due to usage

    - ▪ Predictive analytics, which should take into account whether a component is new or re-manufactured

    - ▪ EPES requires for optimal planning

      - • Costs of remanufacturing

      - • Time for delivery of a re-manufactured component

        - o Pre-order period, etc.

2.2.2 ComVantage Project

ComVantage[6] will build on top of best practices from the Web for providing product-centric and workflow-based mobile apps. This includes the novel data publishing and integration practice *Linked Data* as well as Web 2.0 technologies such as (micro-) blogging, tagging, wiki-based collaboration, and light-weight data APIs for private use in virtual factories. The collaboration space will be an extension to existing business and engineering software that enables to share selected business data and machine data of inter organisational relevance to increase efficiency and flexibility of production processes throughout a dynamic network of manufacturers. ComVantage as collaborative manufacturing network for companies of any size will lead the European market to competitive advantage and sustainable business operations. ComVantage and EPES will collaborate in dissemination: special sessions in Conferences, Workshops and conjoint presentations, and will collaborate in business networks research.

2.2.3 Bivee Project

Bivee[7] project aims to develop a conceptual reference framework, a novel management method and a service-oriented ICT platform to enable Business Innovation in Virtual Factories and Enterprises. Bivee seeks to take the risk out of optimising complex supply and productions chains

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[6] http://www.comvantage.eu/
[7] http://www.bivee.eu/

by creating a safe, virtual representation of organisations, products and processes. The project will be of benefit to large corporate and particularly for SMEs. In order to compete with the emerging BRIC economies, European Industrial and Manufacturing organisations need to become more fleet of foot. Process change and real innovation is difficult to achieve when organisations are closely linked and interdependent. Together they form a virtual, networked enterprise. Such an enterprise needs to continually improve production processes and needs to have a means to generate ideas for change, test those ideas in a safe environment, implement the ideas and then monitor the impact. That is Bivee's role. Bivee and EPES share the next complementarities, where collaboration will be focused:

- Exchange on KPIs about innovation
- Collaboration in dissemination: special sessions in Conferences, Workshops and joint presentations

2.3   Dissemination materials

EPES Consortium is continuously launching activities in order to familiarise the users with EPES system. Substantial dissemination activities will take place during the project for the description of the project results and exploitation plans. These activities will be intensified during the final twelve months of the project, with major dissemination efforts using the BCs/demonstrators as references. The project leaflet has been updated due to project month 12 and placed on the web site (http://www.epes-project.eu/), which will be made available up to the first milestone. The website is interactive and contains project and partners' description and regular information on progress. Publications will be produced for industrial conferences, trade journal papers, and publicity articles. Furthermore, EPES Consortium will participate in leading user networking, brokerage events, workshops, professional body conferences seminars, etc.

2.3.1   EPES Web page

EPES project website (http://www.epes-project.eu/) was created at the beginning of the project, in September 2011, and was updated due to month 12. The website has two-parts, where static HTML-site is used for public dissemination, and a private section is used to collaborate and exchange information among the partners for project execution. The website (see Figure 3) will also contain all the public deliverables, news about the project, project events, leaflets etc.

Figure 3. EPES Web page.

2.3.2   Papers

The paper "*Innovative System for optimization of product life-cycle through adapted services*" was presented by Tecnalia at I-ESA'12[8] Workshop on "Factories of the Future (FoF) – Enabling Interoperability over the Complete Supply Chain" on March 20th of 2012, as a pre-conference dissemination event.

The paper *"Discrete Part Manufacturing Energy Efficiency Improvements with Modelling and Simulation"* will be presented by VTT at **International Conference on Advances in Production Management Systems (APMS) 2012**[9], Rhodes Island, Greece in September 2012

2.3.3   Leaflet

The project has developed a second version of the leaflet as dissemination material that can be used for communication towards the scientific and general public. It has been published in the public section of the web page.

2.3.4   Participation to Workshops

EPES consortium participated in the next workshops:

Workshop on Impact of the Factories of the Future PPP held on 15.03.12 in Brussels organized by The European Commission, with the support of the European Factories of the Future Research Association (EFFRA)

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[8] http://www.aidima.es/iesa2012/
[9] http://www.apms-conference.org/

I-ESA'12 Workshop on "Factories of the Future (FoF) – Enabling Interoperability over the Complete Supply Chain" held on March 20th 2012 in Valencia (Spain).

2.3.5   Posters

EPES project will be presented at the ***Winter Simulation Conference (WSC) 2012[10]***, Berlin, Germany, in December 2012

2.4   Participation in the Task Force Manufacturing and Industry

EPES project participates in the Manufacturing and Industry Task Force. The Manufacture and Industry relationships taskforce will support the overall FInES cluster objective to make "The full potential of the Future Internet accessible to, relevant for, and put to use by European enterprises including SMEs". The overall strategy is to involve a broad range of industrial and other enterprises over the coming years in the work undertaken and the results obtained, primarily in the various research projects in the FInES cluster, but also beyond. The scope of involvement will be defined in a strategy plan, but could range from building on the already planned dissemination activities in the projects, to consultations and participatory workshops.

The strategy specifically calls for the following activities:

1. Prepare general awareness campaigns towards the enterprise communities about future business opportunities based on FInES.
2. Create powerful industrial commitment in professional clusters such as industry associations and confederations.
3. Verify opportunities to apply the FInES solutions in various business environments and involve other individual stakeholders mainly from SME clusters.
4. Promote and support pilot integration of FInES results in real enterprise environments.

2.5   Co-ordination of standardisation efforts

Rapid and cost-effective methods for the design of engineering products can provide significant competitive advantage to manufacturing industries. The effective use of knowledge for avoiding repetitive work has demonstrated significant savings in a variety of engineering programs. However, the cost of using this technology is often beyond the resources of small manufacturing enterprises. There is the further challenge of managing this knowledge throughout the lifecycle of a product. Responding to the rapid convergence of Knowledge Based Engineering (KBE) and Product Lifecycle Management (PLM) applications, the EPES consortium will study the submission of a Request for Proposal (RFP) to apply for a standardization of KBE services that would facilitate the effective sharing and use of KBE within a PLM environment.

Knowledge-Based Engineering (KBE) is a key technology: (1) for automating aspects of engineering data generation; and (2) for enabling the explicit representation of engineering data generation processes and engineering best practices. The utility of the technology has been recognized by the progressive integration of KBE functionalities in Product Lifecycle Management (PLM) support tools. However, KBE applications face interoperability issues that may restrict the potential of the effective use and deployment of the technology by end users and vendors alike. Standardization of KBE services reduces the risk of these issues and opens the possibility of using KBE as a core technology for the reuse, sharing and maintenance of engineering knowledge across the PLM spectrum of applications.

EPES Consortium, leaded by EADS, has identified the KBE standardization as a key activity to support interoperability. In this regard, the EADS IW team is in touch with the OMG's *Manufac-*

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turing Technology and Industrial Systems (ManTIS) DTF chair Uwe Kaufmann. The intention is to build on top of an existing OMG RFP authored few years ago, which was approved by OMG's Architecture Board. The RFP is called "KBE Services for PLM". This work was supported by Airbus through a UK research project funded by the Engineering Physical Sciences Research Council. The RFP can be accessed here: http://www.omg.org/cgi-bin/doc?dtc/05-09-11. The next step in this initiative will include further discussion with ManTIS on how to approach the standardisation process in relation to EPES service-based infrastructure. At the moment, aim is to add the initiative into the ManTIS roadmap in the OMG technical Meeting in December 2012. (see http://www.omg.org/news/meetings/tc/ca-12/info.htm)