



# 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

<b>Project Facts:</b>	<b>Duration:</b>	<b>36 Months</b> (September 2011 – August 2014)
	<b>Programme:</b>	<b>FP7 – ICT</b>
	<b>Website:</b>	<b><a href="http://www.epes-project.eu">http://www.epes-project.eu</a></b>



The EPES Project is co-funded by the European Commission under the FoF-ICT theme of the 7th Framework Programme (2007-2013)

Copyright © 2013 by EPES Consortium

All rights reserved.

No part of this project report may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, scanning, or otherwise without prior written permission of the publisher. Except for quotation of short passages for the purpose of criticism and review.

Trademarked names may appear in this report. Rather than use a trademark symbol with every occurrence of a trademarked name, we use the names only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

The EPES project has no influence on the websites mentioned in this report and is not aware of any illegal content on the pages referenced. Moreover, EPES dissociates itself explicitly from all mentioned websites. This statement is valid for all links within this report.

This publication was completed with the support of the European Commission under the 7<sup>th</sup> Framework Programme. The contents of this publication do not necessarily reflect the Commission's own position.

## Authors and EPES Project Partners



Fundacion Tecnalia Research & Innovation

<http://www.tecnalia.com>

Spain



ATB

Institut für angewandte Systemtechnik Bremen GmbH

<http://www.atb-bremen.de>

Germany



Sistepant SL

<http://www.sistepant.com>

Spain



VTT Technical Research Centre of Finland

<http://www.vtt.fi>

Finland



Esteco S.p.A.

<http://www.esteco.com>

Italy



Grupo Tamoin SA

<http://www.tamoin.com>

Spain



nkt cables GmbH

<http://www.nktcables.com>

Germany

EADS INNOVATION WORKS

EADS Innovation Works UK

<http://www.eads.com/>

UK



---

## 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 24 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 *D700.5.1 Report on FInES Cluster Activities* due to month 12.

The document has the following structure. Chapter 1 describes the purpose of this document and its position with respect to the whole EPES project. In Chapter 2, the collaboration activities are presented, including a brief description of the objectives pursued and outcomes achieved.



*Table of Contents*

<b>Summary .....</b>	<b>5</b>
<b>1 Introduction.....</b>	<b>11</b>
1.1 Document Purpose.....	12
<b>2 Collaboration Activities.....</b>	<b>13</b>
2.1 Advances in Production Management Systems (APMS 2012).....	13
2.2 Winter Simulation Conference (WSC 2012).....	13
2.3 3 <sup>rd</sup> Workshop on Impact of the FoF PPP.....	13
2.4 IMAGINE FoF2020 .....	14
2.5 DEMI & AmI-MoSES Workshop.....	15
2.6 Collaboration with other projects .....	16
2.6.1 PREMANUS Project .....	16
2.6.2 ComVantage Project.....	16
2.6.3 Bivee Project.....	17
2.6.4 MSEE Project .....	17



*Abbreviations*

API	Application Programming Interface
CEN	European Committee for Standardization
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
SI	Sustainable Intelligence
SG	Service Generator
SME	Small and Medium-sized Enterprise
SW	Software
SS	Simulation System
VCN	Virtual Collaborative Networks
VFKB	Virtual Factory Knowledge Base



# 1 Introduction

EPES project will develop, within the frame of the Virtual Factory concept, a collaborative system supported by a methodology and a working handbook, which will provide dynamic services to optimize the product life-cycle management, specially the product manufacturing and operation phase (maintenance and upgrades), with a focus on sustainability. To achieve these goals, the EPES project will develop:

- A set of ICT tools allowing
  - easy configuration/adaptation of services
  - storing and re-using knowledge in order to improve existing services and develop new ones
- A methodology and working handbook

The set of ICT tools, together with the methodology and working handbook, will enable the manufacturing companies to enter a continuous process of upgrading their products, along with their life cycle, within the frame of the virtual factory and PSS concept through a configurable and adaptable set of services.

The key components of the EPES solution include, as shown in **¡Error! No se encuentra el origen de la referencia.:**

- **Virtual Collaborative Network (VCN):** to allow the tracking of business optimization opportunities through a networked infrastructure. It also provides collaborative web content and document content management capabilities, and workflow execution capabilities
- **Service Generator Module (SGM):** to allow configuring EPES Services, deploying them, to provide a cockpit/portal to access to the EPES solution, and capabilities to connect the EPES Services to the VCN workflow
- **Decision Making Module (DMM):** to allow decision-makers to optimize and to analyze business process through dedicated tools
- **Simulation Module (SM):** execution of external simulations and provision of parameters for calculation of to-be key performance indicators (KPI)

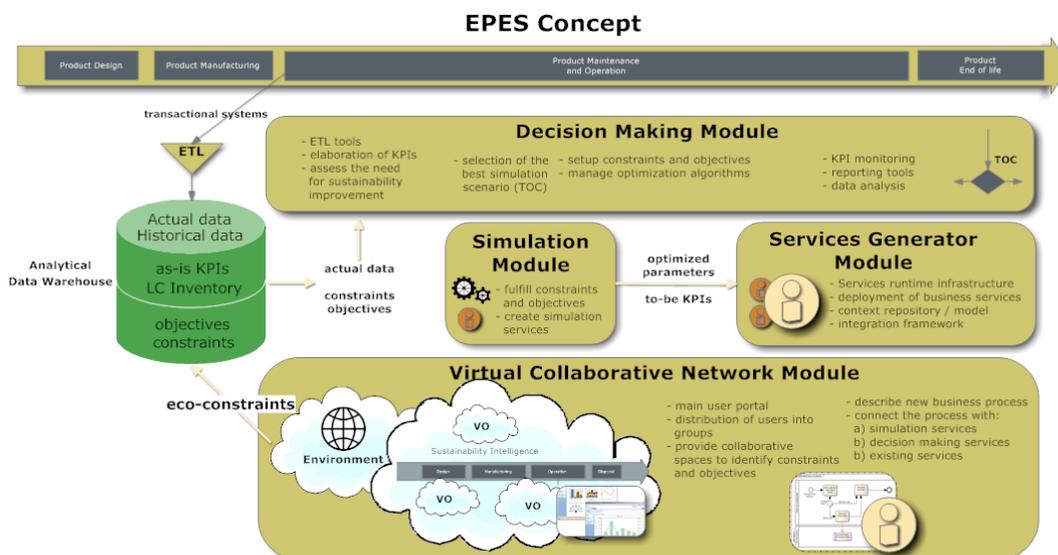


Figure 1. EPES system functionality.

## 1.1 Document Purpose

This document describes the collaboration activities carried out by EPES project consortium so as to foster collaboration and synergies with other FoF projects. These actions were performed during the second year of EPES project and can be considered as tasks connected to the Future Internet Enterprise Systems (FInES) cluster, aiming at the identification of complementarities that leverage the generation of collaboration opportunities.

Future Internet Enterprise Systems (FInES) 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 Collaboration Activities

---

### 2.1 Advances in Production Management Systems (APMS 2012)<sup>1</sup>

EPES project was presented in the European Research project session “Global Research Activities in Energy and Resource Efficient Manufacturing” at APMS 2012 Conference, which was held in Rhodes, Greece 24-26 September 2012. The conference attracted more than 250 delegates and was supported by the IFIP WG 5.7 and by the ATHENA Research & Innovation Centre and the Hellenic Maintenance Society. The APMS 2012 theme was "Competitive Manufacturing for Innovative Products and Services". During the conferences, personal contacts with several EU funded project (e.g. ENEPLAN<sup>2</sup>, EMC2<sup>3</sup> and DEMI<sup>4</sup>) researchers enabled closer collaboration with those projects.

### 2.2 Winter Simulation Conference (WSC 2012)<sup>5</sup>

At WSC (Winter Simulation Conference) December 2012, several contacts and many fruitful discussions with conference participants working in the same field were established. Similarly, contacts with other projects, facilitated by means of the interaction with the FInES cluster, are being intensified to share results and experiences and exploit complementarities.

### 2.3 3<sup>rd</sup> Workshop on Impact of the FoF PPP<sup>6</sup>

EPES Project was presented at the 3rd Workshop on Impact of the Factories of the Future PPP in Brussels on 11-12 March 2013. The purpose of the workshop was to enhance the cooperation links and clustering within the PPP and to facilitate the assessment of its implementation. EPES contributed to ICT for manufacturing session, where the expected / achieved impact of 38 projects comprising topics connected with Smart Factories, Virtual Factories and Enterprises, and Digital Factories was presented and possible synergies and benefits of clustering were discussed. EPES project belongs to the “Virtual Factories” topic, which targets the next general S/T goals:

- Value creating global networked operations, supply-chain management, product/services, management of distributed manufacturing assets

The expected impacts anticipated for the Virtual Factories topics are the following:

- Higher management efficiency of networked business operations
- ICT enabling SME participation in virtual factory environments
- New business models/innovation scenarios for a low-carbon economy

Based on the above presented “Virtual Factories” framework, EPES project contributed to the meeting with the next achieved/expected impacts:

- EPES System (Methodology & ICT Tool) provides a Distributed Virtual Factory environment for product life-cycle optimization through managed eco-constraints originated from Sustainability Intelligence networks, relevant to the market context

---

<sup>1</sup> <http://www.apms-conference.org/Home2012.php>

<sup>2</sup> <http://www.eneplan.eu/>

<sup>3</sup> <http://www.emc2-factory.eu/en/home>

<sup>4</sup> <http://www.demi-online.eu/>

<sup>5</sup> <http://wintersim.org/>

<sup>6</sup> [http://ec.europa.eu/research/industrial\\_technologies/meetings-and-workshops\\_en.html](http://ec.europa.eu/research/industrial_technologies/meetings-and-workshops_en.html)

- EPES ICT Tool enables the composition of interoperable services (EPES Services) that fulfill the eco-constraints via the application of standard methods for modelization of optimized business processes and simulation / optimization capabilities, following main official industry standards, such as BPMN 2.0, UML, CMSD XML and Web Services technologies (SOAP and REST). These EPES Services will leverage the distributed use of optimization capabilities by non-expert users
- Augmentation of previous models with sustainability measurements and tracking capabilities (environmental and social KPIs) to assess the sustainability of the optimized process

These functionalities will be demonstrated by EPES partners and partners' networks by means of the application of three Business Cases:

- TAMOIN: Windmill engineering. Optimization of the maintenance practices to increase turbines availability
- NKT: Energy grids provider. More efficient transfer of wind energy
- EADS: Aircraft manufacturer. Assessment on productivity and sustainability KPIs on wing design concepts

The demonstration results will be disseminated in scientific publications and by means of the participation to joint workshops with other FoF projects.

During the meeting, technical and non-technical cross-cutting issues among the projects that should be taken into account to increase the overall impact were discussed. EPES contributed the next cross-cutting issues:

- Technical cross-cutting issues
  - Innovative dynamic composition of business services, hollistic modeling and simulation of products and processes, sustainable life-cycle management, automated resource search and discovery, collaborative knowledge management, Internet based, user centric collaboration and sharing for the networked enterprise, semantically enriched, context aware and reusable business knowledge, open protocols and standardization
- Non-technical cross-cutting issues
  - Trustworthy and end-to-end service infrastructures

Summarizing, clustering activities are anticipated to discover and exploit complementarities between the projects, foster knowledge sharing and increase the impact of the ICT initiative. Thus, these activities will help exploitation of results after the project end by means of increasing the number of potential customers and rising awareness during the conjoint dissemination activities.

## 2.4 IMAGINE FoF2020<sup>7</sup>

As a continuation of the FoF Impact Workshop (see chapter 2.3), the EC organized a workshop in Geneva on 11-12-13 June 2013, proposed to the projects addressing the FoF<sup>8</sup>. EPES participated in the “Virtual Manufacturing” session, where a success story involving the BC1<sup>9</sup> was shared with representatives of ComVantage, PREMANUS, LinkedDesign, Imagine, VFF, MSEE

<sup>7</sup> <http://ec.europa.eu/digital-agenda/en/news/imagine-fof2020-factories-future-towards-horizon-2020-report-session-virtual-factories>

<sup>8</sup> <http://www.innolab-swiss.eu/cde-conference-presentations.html>

<sup>9</sup> <http://www.innolab-swiss.eu/cde/presentations/Session%20C%20-%20Projects%20Presentation%202013%20-%20ImpWkshp%20Geneva%20VIRTUAL%20Factories.pdf>

and ExtremeFactories projects (see Figure 2), and with the audience. The discussion focused on two main areas regarding the success stories of the initiative and their outcome, and the impact that the whole initiative has achieved and is expected to achieve, including the competitive advantages that it offers to the European manufacturing industry. This led to a discussion regarding the future of similar initiatives and the key activities that should be planned.

<b>FoF – Virtual Factories Projects Cluster</b>	
	<b>ComVantage:</b> Collaborative Manufacturing Network for Competitive Advantage <a href="http://www.comvantage.eu">www.comvantage.eu</a>
	<b>MSEE:</b> Manufacturing Service Ecosystem <a href="http://www.msee-ip.eu">www.msee-ip.eu</a>
	<b>IMAGINE:</b> Innovative End-to-end Management of Dynamic Manufacturing Networks <a href="http://www.imagine-futurefactory.eu">http://www.imagine-futurefactory.eu</a>
	<b>LinkedDesign:</b> Linked Knowledge in Manufacturing, Engineering and Design for Next-Generation Production <a href="http://www.linkeddesign.eu">www.linkeddesign.eu</a>
	<b>EPES:</b> Eco Process Engineering System for composition of services to optimize product life cycle <a href="http://www.epes-project.eu">http://www.epes-project.eu</a>
	<b>ExtremeFactories:</b> Internet-based platform implementing agile management methods for enabling the set-up, monitoring and follow-up of business innovation processes in industrial SMEs. <a href="http://www.extremefactories.eu">www.extremefactories.eu</a>
	<b>PREMANUS:</b> Product Remanufacturing Service System <a href="http://www.premanus.eu">www.premanus.eu</a>
	<b>ADVENTURE:</b> ADaptive Virtual ENterprise ManufacTURING Environment <a href="http://www.fp7-adventure.eu">www.fp7-adventure.eu</a>

Figure 2. Virtual Factories Projects Cluster

The report that summarizes the session can be found following this link:

- [Report of the Session: Virtual Factories. Manufacturing Competitive Advantages](#)

## 2.5 DEMI & AmI-MoSES Workshop

To maximise the number of potential customers, the interest of the EPES partners in disseminate the results in specific workshops with other projects not technically connected with EPES project is essential. Using this method we can provide the access to a wider group of enterprises and exchange the experiences among different projects and their dissemination.

For example, two workshops together with AmI-MoSES<sup>10</sup>, DEMI<sup>11</sup> and other national projects were hold in February and April 2013 in Bilbao and San Sebastian.

<sup>10</sup> [www.ami-moses.eu](http://www.ami-moses.eu)

<sup>11</sup> [www.demi-online.eu](http://www.demi-online.eu)

## 2.6 Collaboration with other projects

The current collaboration activities with PREMANUS, ComVantage, Bivee and MSEE “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.

### 2.6.1 PREMANUS Project

The goal of PREMANUS<sup>12</sup> 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:

- 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 **¡Error! No se encuentra el origen de la referencia.**) 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.

### 2.6.2 ComVantage Project



ComVantage<sup>13</sup> 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 prac-

<sup>12</sup> <http://www.premanus.eu/>

<sup>13</sup> <http://www.comvantage.eu/>

tice *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.

### 2.6.3 Bivee Project



Bivee<sup>14</sup> 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 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

### 2.6.4 MSEE Project



MSEE<sup>15</sup> project the project aims at:

- Establishing scientific and methodological foundations for **service-oriented** virtual factories and enterprises
- Developing a **collaborative industrial model** for Manufacturing Innovation Ecosystems,
- Adopting Future Internet architectures and platforms to next generation software applications for virtual factories and enterprises
- **Aligning Business with IT** by collaborative development and delivery platforms,

<sup>14</sup> <http://www.bivee.eu/>

<sup>15</sup> <http://www.msee-ip.eu/>

- Building Service-oriented, collaborative industrial models for European manufacturing industry
- Experimenting Service Orientation and **Innovation Ecosystem** as an opportunity for sustainable, healthy growth, beyond the current crisis situation
- Creating, nurturing and implementing in the EU manufacturing industry and EU society in the large a **Manufacturing Service Ecosystem** self-sustainable impact action plan, via training, dissemination, standardization and exploitation activities

MSEE and EPES exchanged ideas about Enterprise Content Management (ECM) systems that implement BPMN workflow platforms compliant with the 2.0 standard. BPMN 2.0, standardized by the OMG<sup>16</sup>, became an official industry standard for modeling business processes. The standard enables business oriented individuals and IT developers:

- Share business processes using the same vocabulary
- Share the business models, even between organizations, fostering interoperability
- Bridge the gap between business and IT layers
- Leverage round-trip-engineering

---

<sup>16</sup> <http://www.omg.org/>