Project Results

OPEES
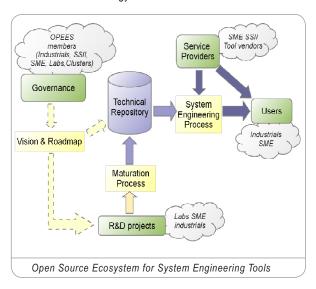## From open-source platform to open-source ecosystem

Open-source tools for system engineering allow the tools to be adapted to run on new hardware or benefit from the openness of the soft code to migrate more easily to a new version of the tools. An open tool platform makes it possible to adapt tools to one's own process and ensures the long-term availability of tools. OPEES aimed to create a community and build the necessary means and enablers to ensure long-term availability of innovative engineering technologies in the domain of dependable/critical software-intensive embedded systems.

Long-term availability is essential to embedded-systems deployment. Imagine you have a problem in an embedded system. While the know-how to fix it may exist, if the hardware is no longer available or the tool chain too outdated so as to be incompatible, the embedded system cannot be rebuilt. Since the maximum support period for proprietary engineering tools tends to be ten years, it is necessary either to migrate to a new platform, to re-engineer the entire system or to accept the absence of support.

The ITEA 2 OPEES project set out to build a community to ensure the long-term availability of these open source tools for critical industrial sectors such as aerospace, transport and energy.

Open Source Ecosystem for System Engineering Tools

THE PATH TO POLARSYS
The viability of such an ecosystem required several elements to be established during the project:

- An open and visible organisation with a worldwide dimension, implementing the business models/business plan and dissemination plan defined in the project, allowing the emergence of a European service industry able to create profitable business and employment
- An open technical repository that holds an initial set of core components and tools matured and assessed following the OPEES methodologies, and that supports collaborative works around these components
- A set of processes and guidelines for tools/components maturation, verification & qualification, for the candidate tools/components validated through experimentations on real use cases to ensure components durability and interoperability, through promotion of open standards, in adequacy with industrial needs, constraints and domain standards.

The outcome of these efforts became manifest with the creation of Polarsys, implemented as an Industry Working Group in collaboration with the Eclipse Foundation. Polarsys organises the open-source and business ecosystem around tools for the development of dependable embedded systems to create better tooling and enable long-term support for these tools as well as collaboration between embedded systems developers as tools end-users and tool developers. It implements a specific infrastructure to ease long-term availability of tools, providing a common and vendor-neutral build-and-test infrastructure designed to last for years.

STRONG EUROPEAN DIMENSION
Many of the tools to be managed by Polarsys already existed and were being used by systems developers. For example, Astrium uses the TopCased UML2 model-driven engineering environment for embedded software and safety-critical application development in satellites while a number of OPEES partners
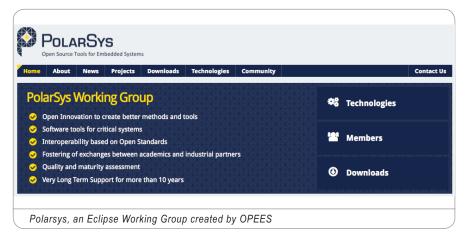
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use Frama-C to check the correctness of embedded software. However, several new technologies had to be developed, including important components for model-based systems engineering. These included parts of Papyrus, TopCased, GeneAuto as a qualifiable code generator, Unisim for simulation, Binary Interface Tool to handle interfaces between components and ArCon to validate models. The objective was to have all the parts of a full-feature tool chain.

The strong European dimension of the project consortium, involving large organisations as well as smaller companies and research teams, along with the dissemination activities enabled the OPEES initiative to spread through a larger number of European countries by establishing collaborations with other projects like CESAR, VERDE, OpenCOSS and CHESS. National and European competitiveness clusters also provided strong support to OPEES, playing an important role regarding dissemination. The offer of long-term support by some service providers (larger organisations and SMEs) for OPEES components not only demonstrated

the interest in a medium-term relationship among technology experts, service providers and industrial end users but provided a boost to the aim of scaling up this LTS relationship with other end users, and for other Polarsys components to expand the ecosystem around Polarsys.

REINFORCING THE EUROPEAN POSITION
The creation of very long-term support for a business-oriented, open source framework and community driven by end users is a real innovation generated by this project. The key outcomes are the open and visible Polarsys structure that allows the emergence of a European service industry, a common vision and roadmap, which enables the results of R&D collaborative projects to be extended and shared through an open technical repository of tools/components in the domain of embedded systems/software engineering. Polarsys reinforces the European influence in the worldwide Eclipse community and positions Europe at the centre of the Embedded and Industry community in Eclipse.

Polarsys, an Eclipse Working Group created by OPEES

Major project outcomes

Creation of Polarsys as an Eclipse Industry Working Group that oulives the OPEES project

DISSEMINATION
- >20 publications including OPEES Open Source Business Model Guide, Catalog of OPEES Services, Identification of OPEES technological domains, Interoperability Specification for OPEES Components, Contract-Based "OPEES Components" Composability, Exploring Tool Support for Long-term Maintenance of Digital Assets
- >25 presentations at conferences/fairs including EclipseCon Europe 2012, ERTS 2012, Embedded World Conference 2012, FOSSA 2010, DASIA 2011

EXPLOITATION
- 7 new Open Source components
- 19 Open Source components in the Polarsys technical repository including Acceleo, Arcon, ATL, EGF, GeneAuto, Papyrus, Polychrony, Topcased
- 25 services tested to support the Polarsys community

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