

Aerospace: better, faster and less costly design

Interview with [Patrick Farail](#), head of embedded software development at Airbus and Topcased project coordinator.

Topcased, led by Airbus, was one of the flagship projects for Aerospace Valley, the Midi-Pyrénées and Aquitaine competitiveness cluster. The resulting components met with great success. The many organisations involved in this project include INRIA, a key partner for research into embedded systems.

INédit: *In what ways did the platform meet Airbus' requirements?*

Patrick Farail: Topcased (Toolkit in Open source for Critical Applications & Systems Development) is already being used, particularly for development of the A350 and Astrium satellites. In fact, Airbus and Aerospace Valley manufacturers need a platform that makes it possible to enhance their embedded software over several decades. The aim, above all, is to ensure the durability of development methods and tools for critical embedded systems, some of which are from INRIA, while minimising the cost of ownership. It is also necessary to take account of regulatory certification constraints, and incorporate advances from the academic world and methodological changes as early as possible. To achieve this - and this point is a major innovation - Topcased is distributed as open source, which makes it



Topcased is being used to develop the new Airbus A350. © Airbus

possible to accelerate the technology transfer of research findings. Durability is provided by the straightforward integration of components, particularly those coming from research laboratories, and the use of international standards. The idea, in fact, is to offer an alternative to proprietary modelling solutions, viewed as too dependent on their publishers' strategies, and also to ensure this alternative lasts for 30 to 50 years (lifespan of an aerospace program). The architecture chosen is based on Eclipse, an integrated, free, extensible, universal and versatile environment, used to create development tools for any programming language. Lastly, Eclipse and Topcased open standards make it possible to reduce the costs of skills acquisition and the dissemination of Topcased tools in education. Future engineers will thus have experience in using the platform before joining our company.

INédit: *What was INRIA's contribution?*

Patrick Farail: Four INRIA teams are involved. Vasy and Espresso worked on certain fundamental aspects such as verification of properties. Espresso developed synchronous

language modelling and formal verification tools, and connected Topcased to its Polychrony software, which facilitates the integrated development of real-time embedded applications. Vasy's interest was asynchronous technologies and it helped develop Fiacre, a formal language for describing, simulating and verifying real-time, embedded, distributed systems. Vasy's CADP (Construction and Analysis of Distributed Processes) tools are accordingly connected to Topcased

through Fiacre. Atlas and Triskell meanwhile, produced innovative tools for model transformation with ATL (Atlas Transformation Language) and Kermeta, an executable meta-modelling language.

INédit: *What about development?*

Patrick Farail: Over four years, the project has delivered several versions of the Topcased workshop, which includes template publishers prioritising an automated approach to

their development, process technologies such as ATL, and model-checking workflows based on the Fiacre language. It also provides support to the cross-functional activities of version and configuration control, along with managing requirements and code development. Success has been achieved, with a steady rate of 6,000 downloads per month and many manufacturing and academic uses. This year, Topcased version 5 will be released. Thanks to the European Artemis programme on embedded software, the ITEA2 European co-operation research and industrial development programme in the field of embedded, distributed software and France's National Research Agency (ANR), other teams will add functionalities. In particular, the OPEES platform (ongoing ITEA project) will ensure the durability of components produced by the Topcased project. ■

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