

Bringing It All Together

I-Logix' Rhapsody UML-based application development platform combined with services and support aid THALES in unifying software and systems development across all 12 of its business units

When companies become large, the lack of information sharing, data, technologies and working best practices can cause severe problems. Even companies with only a few dozen employees will experience cases where engineers tackle common tasks in different ways, use different tools and have their own spin on what it is they think they are making. In such cases, jobs are often done twice, sometimes not at all - and the lack of standardisation, in terms of tools and methodologies, within the company leads to inefficiencies across the board.

Now, consider how it must be for large corporations - organisations employing thousands of people, many of whom are not even based in the company's country of origin. Most of these organisations have teams of engineers, multiple projects, and systems comprising electronic, software, mechanical elements - coming together from different corners of the world. It is extremely difficult to ensure that the systems that are developed actually meet the customers' requirements.

It is all too easy to see how you could soon have a situation where whole teams are working in different ways - unless you standardise on tools and methodologies across the entire development organisation: which is exactly what defence company THALES (formerly Thompson-CSF) is in the process of doing under the guidance of its THALES/TTM (THALES Tools and Methodologies) business unit. THALES is at present pooling its technical and industrial disciplines, procedures and practices.

THALES is divided into 12 business groups, each devoted to specific areas of business such as: Avionics, Simulation, Air Traffic Management, and Airborne Systems. THALES/TTM, operating as a corporate technical business unit over all 12 business groups, is charged with identifying and selecting 'technological building blocks' in order to shorten project lead times, reduce risks, and guarantee technology adaptation fit for specific and demanding roles (for example, defence and aerospace).

Michel Galinier, Software and Systems Manager at THALES/TTM in Orsay, France, comments: "TTM focuses on three main activities. One, adopting methods, processes, and development tools for our technical and industrial disciplines. Two, the selection of technologies, for example the assessment of COTS and architecture "building blocks". And three, information sharing - for example knowledge management."

Galinier goes on to say within these distinct activities, common disciplines are addressed. "For example, all three encompass programme management, systems engineering, software, hardware, mechanical, logistics, purchasing, technical documentation, and web technologies."


Key to TTM's strategy is THALES standardising on CAD tools for electronics, software, mechanical and systems development - and integrating all within a project management strategy that will unify the whole of THALES.

Work on establishing common engineering and management technologies in THALES began in the 1990s - tightening (standardising) practices for hardware and software development. Galinier recalls: "Three years ago, to manage the object technology and risk/opportunity in software we decided to set up a common approach with the selection of Jacobson for Object Oriented Design and the Unified Modelling Language™ as a notation."

The Unified Modelling Language (UML™), the most common modelling language in use for software development, is frequently used in firmware and real-time embedded systems development. In many organisations object oriented techniques and the UML are being used by systems engineers to specify the architectural structure of the overall system.

TTM reviewed a number of UML supportive products including: I-Logix' Rhapsody®, Rational's ROSE, ObjectTeam's Objecteering and Artisan's Real Time Studio. Galinier comments: "We set up a benchmark for tools supporting UML and this benchmark focused on two sets of users; software engineers and systems engineers. For software engineering the requirements included Jacobson methodology support and automatic code generation. For systems engineering the requirements included being able to describe system





architecture with UML, the need for a good user interface, documentation generation and simulation/animation."

The benefits of using UML for system specification are two-fold. First, for systems that are software centric, the use of UML allows easy transition from the systems engineers to the software developers. And secondly, the behavioural model of UML is based on Harel Statecharts - a well defined executable language, which means that a specification of a system in UML can be executed and evaluated for consistency, accuracy and fidelity before it is partitioned into (amongst others) mechanical, electronic and software 'blocks'.

Galinier resumes: "Systems engineering is much more than just partitioning hardware and software - systems also include mechanical and optical components, and it is crucial to be describing all of your system if you are to see how it interacts. For example, an infra-red camera is in fact mechanics, optics, software and electronics - and to describe the architecture of the system we use UML."

On TTM's recommendations, the THALES' shareholders have chosen to adopt I-Logix' Rhapsody for both software and systems development. Rhapsody automatically generates production-ready code at any point in development. It does this by employing a real-time execution framework 'beneath' the GUI, which means Rhapsody can automatically generate not only the source code but also make files and even invoke the compiler and linker. As for Rhapsody's use for systems development, Galinier praises the tool's GUI and simulation capabilities.

But Rhapsody's aptness for software and systems generation was, according to Galinier, only part of the reason I-Logix was selected: "The tool's selection is not only based on technical satisfaction but also on the tool provider - their world-wide subsidiaries, and the level of technical co-operation they can provide. We often need to customise tools and for that we need the help of I-Logix - for example to set up interfaces with other tools such as Telelogic's requirements management tool DOORS". In addition I-Logix is in the process of introducing bridges based on XMI, the XML-based Model Interchange standard that allows models to be imported and exported into both its Statemate MAGNUM™ and Rhapsody tools. Statemate MAGNUM is a widely used tool for systems engineering following a functional decomposition approach.

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The fact that I-Logix is focusing on standards in terms of languages (like C, C++ and Java) and in terms of notations/interfaces (UML and XMI) is perceived, by THALES, as a major plus because it then becomes possible to share designs with other tools utilising the same standards. Also, by adopting and building on standards, I-Logix' longevity is perceived as more guaranteed than that of vendors developing tools that use proprietary languages, notations and interfaces: and supplier longevity is very important to THALES as projects can be as long 25 years.

THALES uses many programming languages and needs to maintain code throughout its numerous projects and UML is certainly helping define, generate and maintain such code. In addition though, UML is also proving a worthwhile notation and methodology in defining system architectures - and here its uses extend outside of THALES.

"By defining and describing system architectures in UML it is possible to communicate with the customer," concludes Galinier. "It's possible to have reviews with the customer and to share the same vision." In addition, with the executability of the Rhapsody UML models, these designs can be visualised, easily understood, and validated by virtually all of the team members involved.

THALES, having standardised on Rhapsody, plans to integrate with other CAD/CAE tools to create a powerful systems engineering environment - one that is both model and simulation based.

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