SOFTEAM BACKGROUND AND EXPERIENCE

Founded in 1989, SOFTEAM has more than fifteen years' experience in object oriented methodology, and has been editing and distributing an object-oriented CASE tool since 1992. SOFTEAM is involved in the following three main activities:

- CASE tool publishing with the **Modelio**[1] (formerly **"Objecteering"**) CASE tool, which has been on the market since 1992,
- Consulting: As a provider of object-oriented methodology, and as an active OMG contributor,
- Training: SOFTEAM provides training in related technical areas (languages, techniques, tools) and in methodological areas.

SOFTEAM is an SME of about 220 employees, based in Paris, and having subsidiaries in Saint Quentin en Yvelines, Rennes, Nantes and Sophia Antipolis.

SOFTEAM solutions and services are used in many industrial domains including: aerospace & defence, automobile, telecommunications, banking & insurance. The list of references can be found at the following URL: http://www.softeam.fr/references_clients.php

1.1. OMG Contributions

As a contributing member and voter since 1994, SOFTEAM is deeply involved in the work of the OMG and, in particular, the standardization of UML. SOFTEAM, represented by the VP of R&D, Philippe DESFRAY, maintains a close synergy between the significant R&D efforts and its involvement within the OMG.

As a member of the ADTF (Analysis & Design Task Force), a member of UML RTF (Revision Task Force) and UML FTF (Finalization Task Force), SOFTEAM continues to influence the UML standard and related technologies. In particular, SOFTEAM directed the introduction of the following technological advances:

- **UML profiles**, based on its R&D work and its precursor tools.
- flow diagrams (information flow) and protocol state machines within **UML 2.0**
- definition of the **SPEM** (Software Process Engineering Metamodel) standard, directed by SOFTEAM
- Among others, SOFTEAM participated in elaboration of **U2TP** (UML2 Test Profile) and **MARTE** (Modeling and Analysis of Real Time and Embedded Systems)
- **SoaML** the SOA modelling language specification.

SOFTEAM was forerunner and promoter of MDA technologies (Model Driven Architecture), now at the centre of the OMG's strategy. SOFTEAM puts great emphasis on applying MDA to UML.

SOFTEAM is one of the very few European companies authorized to participate in decisions coming from the OMG, and all its activities at the OMG make it one of the major worldwide UML players, particularly so in France.

[1] http://modeliosoft.com

1.2. Recent EU Research Projects

For more than 15 years, SOFTEAM's R&D Department actively participates in various national and European research projects in the software engineering and modelling domains. The following list overviews the most relevant recent projects.

1.2.1. Embedded Systems

ENOSYS (http://www.enosys-project.eu)

The main objectives of the ENOSYS project (FP7-ICT-2009-4) are to shorten time to market and to reduce design costs in the development of new electronic products. This is of prime importance to European companies seeking to increase their share of the competitive consumer electronics market, where the flexibility to move quickly to add distinguishing features, such as faster operation, lower power consumption or miniaturization, is paramount. ENOSYS will achieve this by allowing designers to work at a high level of abstraction and removing the need to concentrate on the time-consuming details of the design.

SOFTEAM is the **Coordinator** of the ENOSYS Project and is involved in the following research activities:

- OMG MARTE specification implementation, customisation and extension for the SoC domain towards automated software and hardware partitioning and automated design synthesis.

MADES (http://www.mades-project.org/)

The MADES project (FP7-ICT-2009-4) aims to develop a holistic, model-driven approach to improve the current practice in the development of embedded systems. The proposed approach covers all phases, from design to code generation and deployment.

Design activities will exploit a dedicated language developed as an extension to OMG's MARTE Profile intended to eventually become industry standards, and will foster the reuse of components proposing special means on components sharing including associated models, properties and constraints in order to enforce overall consistency when building a new system.

Validation activities play a key role and will include the verification of key properties on designed artefacts, closed-loop simulation based on detailed models of the environment, and the verification of designed transformations.

Code generation addresses both hardware description languages and conventional programming languages with features for compile-time virtualisation of common hardware architecture features, including accelerators, memory, multiprocessor and inter-processor communication channels, to cope with the fact that hardware platforms are getting more and more complex.

SOFTEAM is the **Technical Coordinator** of the MADES Project and is involved in the following research activities:

- OMG MARTE specification implementation, customisation and extension for the avionic radar systems domain;
- Model Component Repository development;
- Verification and Code Generation.

SEROUS (http://www.hitech-projects.com/euprojects/serious/)

The Serious project stands for Software Evolution, Refactoring and Improvement of Operational & Usable Systems. It is an Information Technology for European Advancement (ITEA) project co-funded by the EC. Among other partners the consortium involves Alcatel, Nokia and Philips.

The SERIOUS project aims at the break-through of turning the current practice of handcrafted evolution to a methodologically sound techniques supported by industry-adoptable tools including corresponding development processes for the evolution of operational software-intensive systems. In the SERIOUS project the software evolution related issues are addressed which is currently hardly explored territory in software engineering.

SOFTEAM is involved in researches in the following domains:

- UML Profile for system programming with C;
- C-code generation and security verification;
- Prototype on base of Objecteering Tool Suite.

MARTES (http://www.martes-itea.org)

MARTES is a EUREKA-ITEA project on a Model-based Approach to Real-Time Embedded Systems development. The consortium includes the big industrial companies – Nokia, Thalès, Philips and Telefonica.

The aim of the MARTES project is the following: The definition, construction, experimentation, validation and deployment of a new model-based methodology and an interoperable toolset for Real-Time Embedded Systems development, and the application of these concepts to create a development and validation platform for the domain of data stream dominant applications on embedded heterogeneous platforms architectures.

SOFTEAM is involved in researches in the following domains:

- UML Profile for embedded systems modelling – CoDesign;
- SystemC code generation;
- Prototype on base of Objecteering Tool Suite.

1.2.2. Complex Systems and Service Engineering

SHAPE (http://www.shape-project.eu/)

The SHAPE project (FP7-ICT-2007-1) aims to support the development and realization of enterprise systems based on a Semantically-enabled Heterogeneous service Architecture (SHA). SHA extends Service Oriented Architectures (SOA) with semantics and heterogeneous infrastructures (Web services, Agents, Semantic Web Services, P2P and Grid) under a unified service oriented approach. To achieve this the consortium of the SHAPE project will develop a Model-Driven Engineering (MDE) tool-supported methodology and will take an active role in the standardization of metamodels and languages for SHA.

SOFTEAM is involved in researches in the following domains:

- SOAML specification within the OMG standardization body;
- SOAML and SHAML UML2 Profile implementation with Objecteering;
- SOA and SHA methodology elaboration.

MODELPLEX (http://www.modelplex-ist.org/)

MODELPLEX is an EU IST-34081 (Integrated Project), which is an official follow-up of the MODELWARE project. MODELPLEX funded with €20M. It has started in October 2006 and is planned for 36 months.

SOFTEAM is involved in researches in the following domains:

- SPEM process enactment
- ModelBus – modelling service orchestration. (Eclipse MDDi. http://eclipse.org/mddi/)
- MDATC – standardization and improvement of interoperability of MDA Modellers. (Eclipse MDDi. http://eclipse.org/mddi/)
- Model-based verification of SOA architectures

MODELWARE (http://modelware-ist.org/)

The MODELWARE project has ended in the end of September 2006. MODELWARE was an integrated project with a budget about €20M and regrouping about 20 partners all over the Europe. It was the biggest MDA devoted project.

MOMOCS (http://www.momocs.org/)

The MOdel driven MOdernisation of Complex Systems (MOMOCS) is an EC IST project with the project funding of €4,16M involving Siemens and Telefonica among other partners.

MOMOCS aims at studying a methodology and related tools for fast reengineering of complex systems. A complex system is characterised by an interconnection of hardware, software, user interfaces, firmware, business and production processes.

SOFTEAM is involved in researches in the following domains:

- Development and formalisation of a generic modernisation process using SPEM;
- Development of UML Profile for representing of complex system architecture (system, software, components, dependencies);
- Gap and impact analysis using dependency analysis methodologies;
- GUI for editing specific system models (customisation of Objecteering Tool Suite)

WebMov (http://webmov.lri.fr/)

The Web Service Modelling and Validation (WebMov) project is a French national research project which intends to contribute to design, composition and validation of Web Services through a high level abstraction views of a SOA based logical architecture enabled with the state-of-the-art formal testing technologies. In particular the project provides a research for active and passive testing of SOA architectures and concentrates on the behaviour validation (conformance, reliability, fault tolerance) of the Web Services expressed in BPEL. For this the formal methods such as TEFSM (Time Extended Finite State Machine) are used.

RTE Space (ESA ESOC funded)

RTE Space is an ESA funded fixed-price R&D project for evaluation of on the market MDA technologies for round-trip re-engineering of space systems. The project evaluates the current ADM and MDA technologies as well as model based testing on a concrete use case from space domain. The methodology and dedicated tooling will be provided for C++ Code to C++ PSM to PIM to Java PSM to Java Code tool aided transformations and model-based testing.

VIDE

VIsualise all moDel drivEn programming (VIDE) is the IST-033606 EU project with a total budget of about €4M. The VIDE project researches the areas of visual user interfaces, executable model programming, action- and query-language-semantics, AOP and quality assurance on the platform-independent level, service oriented architecture (especially Web services and integration) and business process modelling. Finally, a functionally complete prototype of the VIDE system is implemented, validated and evaluated.

SOFTEAM is involved in researches in the following domains:

- UML Profile for VIDE language;
- Model-Based simulation;
- Prototype on base of Objecteering Tool Suite.

1.2.3. Modelio and Objecteering MDA Tool Suites

With the Objecteering 6 model-driven tool suite (http://www.objecteering.com) and its next generation Modelio (http://www.modeliosoft.com), SOFTEAM provides a complete, simple to use model-driven development solution, dedicated to expressing and managing requirements, building complete and accurate UML models, generating a full range of documentation and automating application code production for Java/EJB, C++, C#/.Net, SQL, CORBA and Fortran. Since recently Enterprise Architecture, Business Process and Service Oriented Architecture modelling and generation features are available in both Objecteering and Modelio with EA-BPM and SOA Architects modules.

With more than 250 interactive real-time consistency checks, these tools manage model consistency in order to guarantee high quality models and correct code generation. Live traceability links are managed throughout the entire development cycle, from requirements, analysis and design through code generation, tests and application deployment.

SOFTEAM also provides users with methodological assistance, automated design patterns and significant customization capabilities, as well as permanently ensuring model/code consistency either in MDE (Model-Driven Engineering) or RTE (Round-Trip Engineering) synchronization mode. Objecteering 6 is able to reverse source code, in order to document or redesign legacy applications, or simply to integrate libraries such as the JDK into the model hierarchy or diagram views.

Modelio and Objecteering provide teamwork facilities through a multi-user repository and flexible cooperative work support, with no limits regarding large-scale developments. In order to allow concurrent modeling, a lock mechanism can be applied down to class level, thereby guaranteeing the consistency of the model shared by team members. Branches are managed through the model diff/merge function. A powerful model component feature can be used to organize project development over several different teams. Once packaged, model components can be easily deployed to efficiently manage communication and model delivery between the different teams involved in a project.

In order to provide our customers with a complete and open solution, plug-ins are available for a wide range of complementary third party tools, such as configuration management systems (IBM Rational ClearCase, Telelogic Synergy/CM, Serena Dimensions, with SCC API: MS SourceSafe, Serena Professional and CVS/igloo) , IDEs, application servers, test tools and requirements management tools (Telelogic Doors).

Furthering our commitment to the success of our clients, SOFTEAM provides a complete development solution consisting of products, support, training and consulting. Our training courses help development teams be more productive when using the model-driven development suites, while our consultants assist analysts, architects and developers in setting up and managing the software development process used on their projects, in using UML and MDA with SOFTEAM products.

Figures 1 and 2 illustrate some key functionality of Modelio through its GUI.

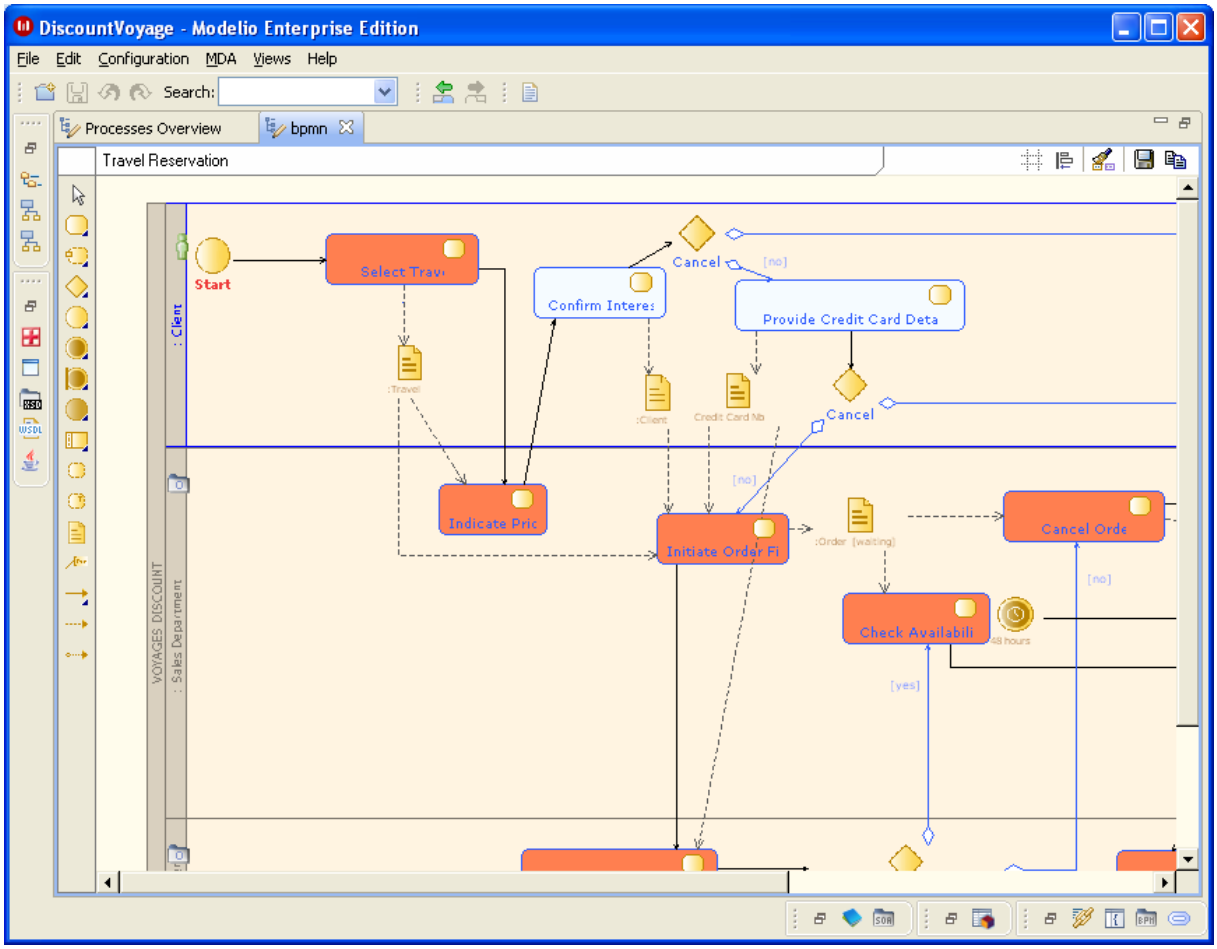

Figure 1 Business Process and Service Orchestration Definition with Modelio

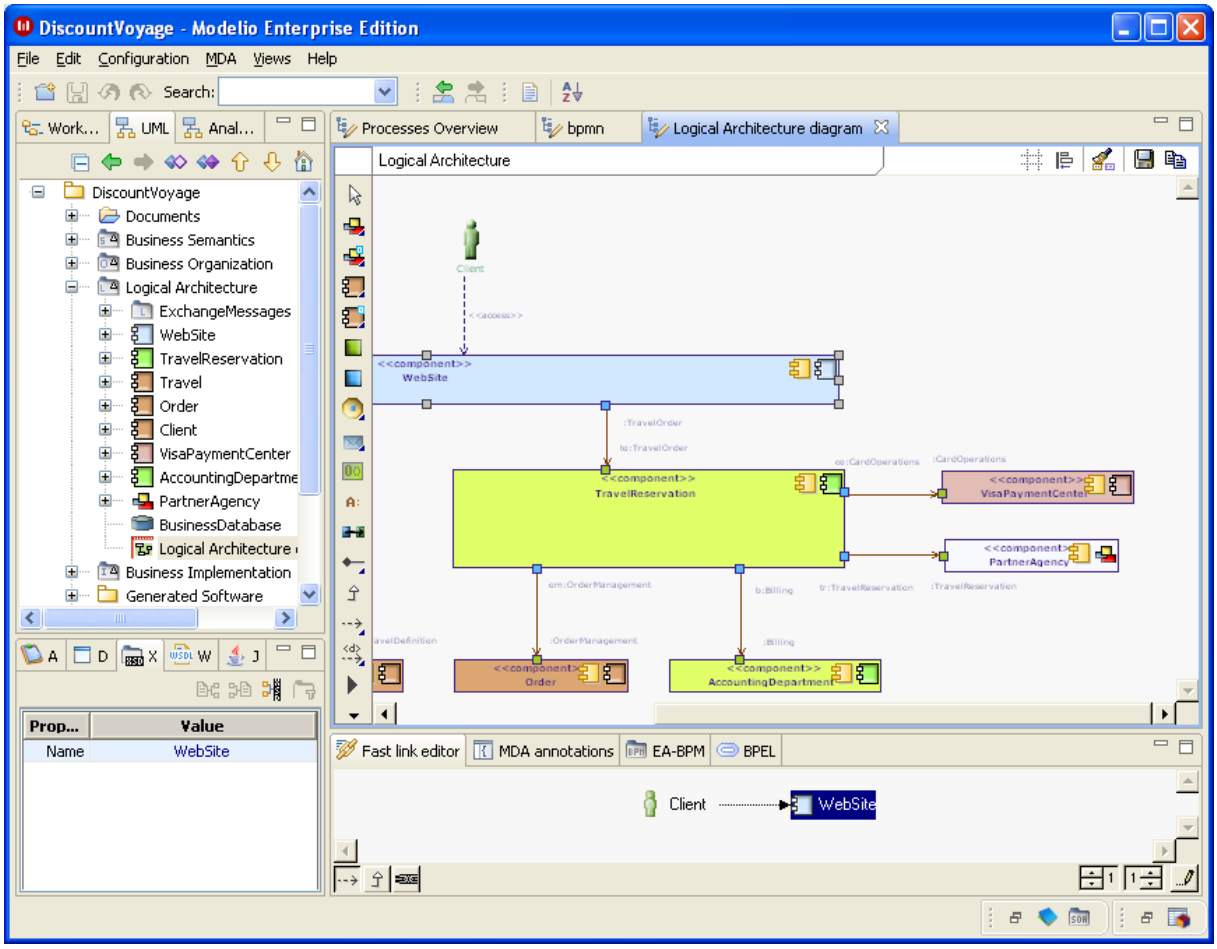

Figure 2 Service Components Composition with Modelio

The integrated EA-BPM Modeler provides comprehensive support of Enterprise Architecture modeling, including Business Process Modeling, based on underlying standards (UML, BPMN) and EA-dedicated extensions (SoaML, Logical Architecture). The model is separated into viewpoints, where each stakeholder can work on dedicated models that are easily to handle and understand.

The integration of EA, BPMN and UML means there is one single model repository for the enterprise, where traceability can be exhaustively managed. Overall consistency between each enterprise stakeholder or participant's view ensures improved Business/Information System alignment.

The model transformation features allow simplifying the passage from conceptual models to design models in UML and further to implementation in a concrete platform: Web Services, Java, C++ and C#.