

# UML adaptation and Code generation



## Customer profile

- CEA DAM: French Atomic Energy Commission, Military Affairs Division
- Design of nuclear heads
- Scientific parallel computing on several thousand processors



**Sector:** Energy

## Application:

Physical phenomena simulation program without nuclear tests

## The Need

The physical phenomena to be simulated (hydrodynamic, thermodynamic, etc.) are first defined in the form of mathematical equations before being translated into "simulation modules". Their design and development require significant investments and it is essential that their longevity be guaranteed.

In addition, to make sure they always benefit from the very best performance available, it is important to be able to migrate towards new platforms and technologies without any need for redevelopment.

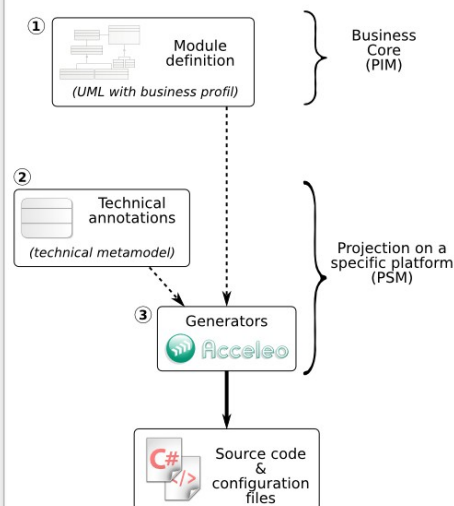
As a result, their development demands unique dual expertise:

- expertise in the simulation of "physical equations" and
- development on massively parallel computers

## The Solution

The approach adopted involves describing the modules in UML independent of the execution technology. The source code (C#) and configuration files (XML), corresponding to implementation of these modules, are generated automatically for execution on the Arcane computing platform.

The tool construction project was carried out in 3 phases:



## The Result

This project demonstrated:

- the flexibility of the model-driven approach, ensuring the reliability of the complex, real-time computers produced;
- the adaptability of the methodology due to explicit breakdown of the various steps in the production of the calculation modules;
- the maturity of the code generators built on Acceleo;
- the sustainability of description of business expertise via calculation models that can be manipulated from a functional (UML) or technical (dedicated meta-model) viewpoint.

This sustainability is reflected in the capacity to separately upgrade the business models, to add new features, and the technical models, to make the most of new generations of massively parallel computers.

## Project rollout

- first work package delivery over 2.5 months, working in close cooperation with a CEA expert.
- skills transfer

« To represent the concepts specific to the CEA's business, Obeo provided its advice for the definition of a specific profile, as well as precise notation rules. The Obeo consultant's suggestion of adding a technical annotation step allowed us to configure the business expertise model so that we can make maximum use of the computing platform. »

**Benoît Lelandais, chef de projet au CEA DAM**