

# Diabolo, the ArcelorMittal framework for *management of Scientific Models Lifecycle*

## Multi-domain and multi-physics advanced use cases

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Nearly 10 years ago, ArcelorMittal's global R&D decided to leverage Scilab and XCos to build a complete solution to support life-cycle management of scientific models. This framework, called Diabolo, offers a business repository to capitalize the scientific documentation and the executable libraries for each model developed in FORTRAN, C, Java and of course Scilab. The platform has an automatic compilation service able to generate and build Scilab gateways and XCos toolboxes around these libraries and make them available in an ATOMS repository. More than 120 researchers from the ArcelorMittal scientific community regularly use the Diabolo platform, which propose now 80 models and powerful tools for data access and models fitting and optimization.

The Diabolo platform has become a key element for the continuous management of models' life cycle. It provides sustainability, Quality Assurance and allows us to progress towards a lean industrialization process. What's more, it's really motivating to see how easy sharing, reuse and chaining of models constitute a booster for creativity!

We will start with two on-going examples of complex physical and mathematical models development. Actually written in Scilab and available as Diabolo toolboxes, these two models come directly from recent PhD works. They are at the first step off the lifecycle from prototyping to industrial implementation and are intended to be converted to industrial code probably written in C language.

Secondly, we will present a prototyping work in early design for steel structure buildings. This project, that can be considered as a PIDO experiment, consisted in the development of a global optimization prototype applied on buildings issues at the early design stage. This prototype was chaining a parametric model of the structure with energy efficiency and environmental footprint modules. The whole design

has been used with the Diabolo multi-objective optimization toolbox to propose an optimized steel structure solution from a global envelope of the building. This work led to the design of an advanced CAD tool currently in development.

Then we will focus on a statistical toolbox dedicated to the automatic generation of linear and nonlinear models from industrial data. This tool formerly developed as a prototype in S-plus (statistical software by TIBCO based on the S language) has been re-written as a Scilab toolbox to capitalize the knowledge and have an efficient tool. The result is a toolbox available under Diabolo but also 'behind' an advanced graphical interface using the *call\_scilab* API. The end-user application offers powerful analysis and filtering tools for statistical expert but can also be used by people with no particular statistical knowledge.

Definitely, we have a lot of ideas for the future and expectation in new possibilities with Scilab (V6, Python, model reduction, automatic conversion to C code, ...)!