

# Simulating Modelica models with a Stand-Alone Quantized State Systems Solver

Federico Bergero<sup>1</sup> Xenofon Floros<sup>2</sup> Joaquín Fernández<sup>1</sup>  
Ernesto Kofman<sup>1</sup> François E. Cellier<sup>2</sup>

<sup>1</sup>CIFASIS-CONICET, Rosario, Argentina

{bergero, fernandez, kofman}@cifasis-conicet.gov.ar

<sup>2</sup>Department of Computer Science, ETH Zurich, Switzerland

{xenofon.floros, francois.cellier}@inf.ethz.ch

This article describes an extension of the OpenModelica Compiler that translates regular Modelica models into a simpler language, called Micro-Modelica ( $\mu$ -Modelica), that can be understood by the recently developed stand-alone **Quantized State Systems (QSS) solvers**. These solvers are very efficient when simulating systems with frequent discontinuities. Thus, strongly discontinuous Modelica models can be simulated noticeably faster than with the standard discrete time solvers. In Fig. 1 we can see the complete proposed implementation of the model transformation, compilation and simulation process.

Extended simulations on two example models were performed, demonstrating the increased efficiency of the stiff LIQSS solvers over the default DASSL solver of OpenModelica. **Consistent speedups were achieved and the required CPU time was reduced up to 40 times**. Furthermore, for the two systems simulated we observed that the default DASSL solver failed to generate the correct results if we didn't force many output points. On the other hand, not only the **QSS solvers simulated correctly** the models at all setups but, because of the **dense output** they inherently generate, the number of steps taken remains constant regardless of how many output points are requested.

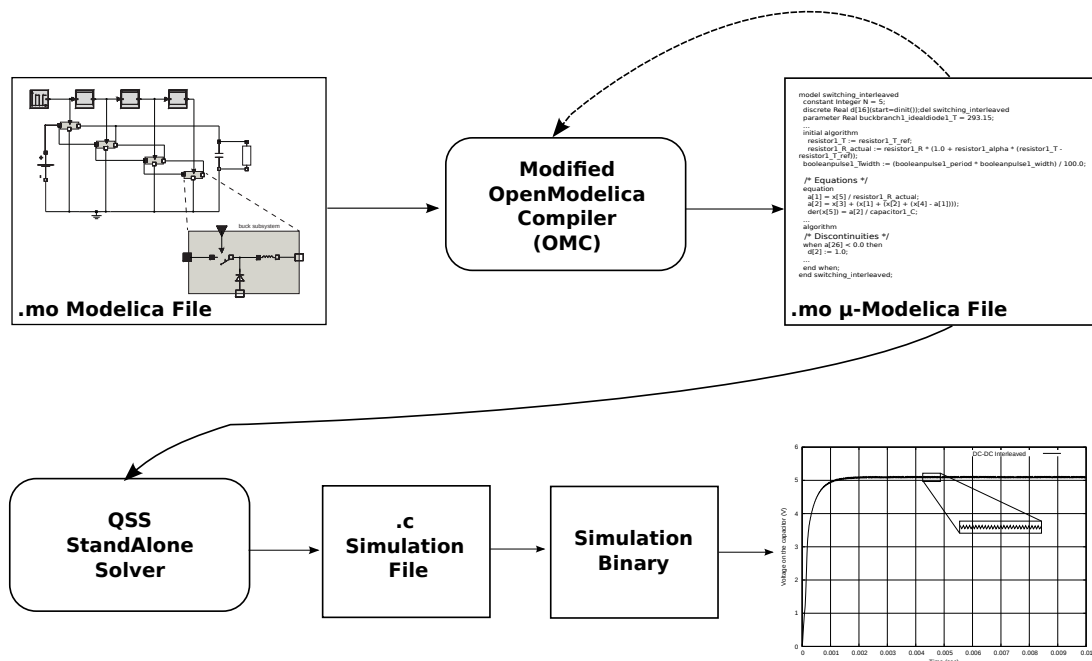


Figure 1: Pipeline of the implemented compilation/QSS simulation process