

# Transmission Modeling in Modelica: A consistent approach for several software development platforms

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## Abstract

Simulation models play a fundamental role in the development of transmission control software. In the ideal case, the same model can be used throughout the whole development process from concept and design over implementation to system verification. The idea is to use one uniform model along this V-scheme. This leads to the requirement that simulations have to be able to run in real-time on hardware-in-the-loop platforms. On the other hand, very detailed models of some components might be needed during the early design phase.

Thus, a trade-off between modeling depth and computational performance has to be found. This may be achieved by selectively simplifying parts of the model that are prone to generating stiff sub-systems or a large number of state events.

Within this framework, the present paper introduces the Modelica simulation model of TraXon, the new modular transmission for heavy commercial vehicles by ZF. The model can be adapted to various needs by replacing components according to the required modeling depth and/or dynamical behavior.

After a brief overview of the ZF in-house Modelica libraries and the architecture of the TraXon model, some approaches and tools are described for evaluating and optimizing models with respect to real-time issues.

*Keywords: ZF Modelica libraries; model simplification; performance analysis; hardware-in-the-loop;*