Functional Mock-up Interface

Introduction

The Functional Mock-up Interface (FMI) is a tool independent set of standards that specify how to couple simulation models built with various simulation software tools or how to couple the simulation software themselves in the aim of performing transient simulations of the coupled system. A simulation software tool which complies with these standards may act:

- either as an exporting tool that can create components called Functional Mock-up Units (FMUs) containing models or simulators to be used by other simulation software
- or as an importing tool that can use FMUs generated by other simulation software

The FMI standards define two kinds of interface:

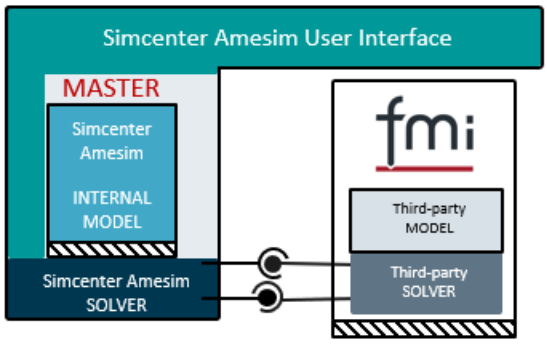
- **FMI for Model Exchange**, which describes a standardized way for interfacing a model, packaged as an FMU, with a simulation environment that provides at least a numerical solver.
- **FMI for Co-simulation**, which deals with the coupling of complete simulators. In this case each slave simulator uses its own numerical solver, either embedded in the FMU (standalone scenario) or accessible through it (tool coupling scenario), within a master co-simulation environment that also uses its own solver.

Simcenter Amesim software now complies with all the discrete and continuous coupling modes currently offered by FMI for both the 1.0 and the 2.0 versions of the standard (8 combinations). More precisely, it is capable to:

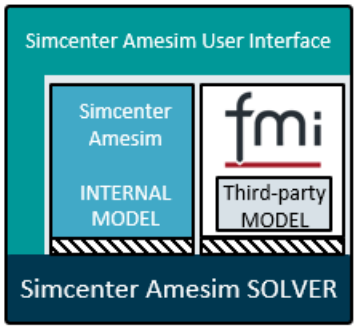
- export **Simcenter Amesim** models as FMUs for Model Exchange in version 1.0 or 2.0
- import third-party FMUs for Model Exchange in version 1.0 or 2.0
- export **Simcenter Amesim** models with their embedded solvers as FMUs for Co-simulation in version 1.0 or 2.0
- import (as a master) third-party FMUs for Co-simulation in version 1.0 or 2.0

The different coupling scenarios are summarized in the following figure:

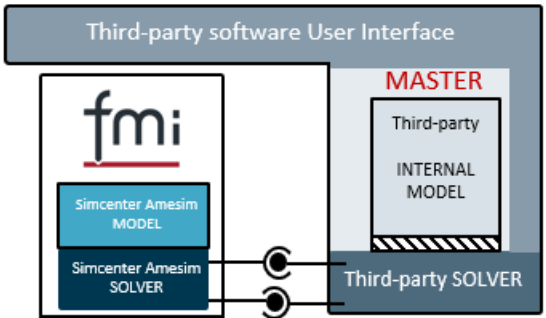
Co-simulation 1.0 and 2.0: Simcenter Amesim as Master



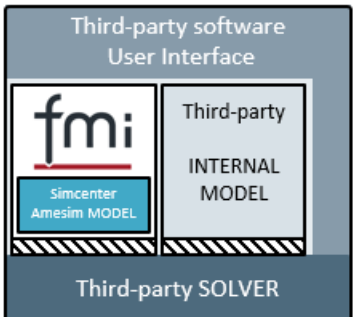
Model Exchange 1.0 and 2.0: Import



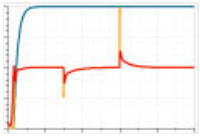
Co-simulation 1.0 and 2.0: Third-party tool as Master



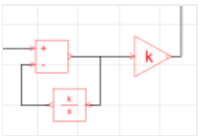
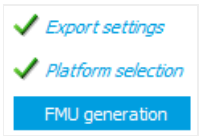
Model Exchange 1.0 and 2.0: Export



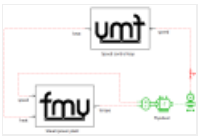
FMI demos

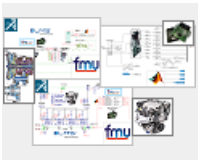
Steam plant - FMI for Co-simulation 1.0
Shows how to generate an FMU for co-simulation, in which the feed water and steam loop of a steam power plant are modeled.

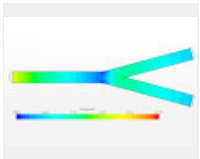
Speed control - FMI for Model Exchange 2.0
Illustrates how to create a 2.0 FMU for Model Exchange from the Modelica implementation of a PID controller. Thus, entire Modelica models can be exported as FMUs for model exchange.




Full model of a steam plant - several FMUs
Illustrates how to import multiple FMUs (Functional Mock-up Units) into a **Simcenter Amesim** model, one to model a steam power plant, and the other modeling the speed control loop of the plant.

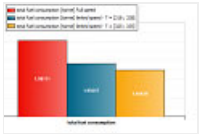



dSPACE SCALEXIO - Multi-model real-time demonstrator using the Functional Mock-up Interface (FMI)
How models designed with **Simcenter Amesim** and exported as Functional Mock-up Units (FMUs) 2.0 can be co-simulated with a Simulink model on a dSPACE SCALEXIO real-time target.

FMI co-simulation with STAR-CCM+ setup guide - Y junction
Taking advantage of the FMI import capability in STAR-CCM+, a **Simcenter Amesim** FMU is exported, and then imported in STAR-CCM+ for co-simulation. A detailed guide on how to set up this type of interface.

Related Solutions demos

Ship central cooling system FloMaster co-simulation
Evaluation of different control strategies of the pump of the cooling system on its performances on the impact on the ship fuel consumption.