

## **The Functional Mockup Interface as an Enabler for Multiscale and Multiphysics Modeling & Simulation**

Hubertus Tummescheit, Modelon Inc.

Edward Ladzinski, Modelon Inc.

The Functional Mockup-Interface (FMI) has been accepted and successfully deployed with early adopters being mainly in the automotive industry. This standard allows for the integration and collaboration between embedded software with physics system level models to address cyber-physical systems. Broad adoption among mechanical modeling tools, system modeling tools, and several specialized domain specific modeling tools made the FMI standard the preferred solution for tool agnostic co-simulation in system level multi-physics problems. The latest trend for simulation tools adopting the FMI-standard is to add capabilities for multi-scale modeling. Several detailed 3D level tools in CFD, FEM and electromagnetics are now announcing different types of solutions to couple the detailed high fidelity 3D level and the system level.

In this presentation, we will provide examples how FMI-based workflows enable design flows that encompass several scales and several types of physics into a comprehensive framework. Examples will show coupling of CFD with mechanics, and coupling of hydraulics, mechanics, controls, and detailed electromagnetics. The interfacing examples presented rely fully on the FMI standard and are therefore to a large extent tool agnostic.