Functional Mockup Interface for Enterprise Architect

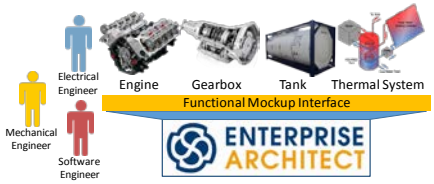
LieberLieber

The Functional Mockup Interface (FMI) defines a standardized interface to be used in computer simulations of complex cyber-physical systems resulting from an assembly of shared simulation units (FMU).Thanks to the Enterprise Architect FMI plugin, FMI modeling and simulation activities are supported by and integrated with Enterprise Architect based technologies.

Goal

There is a strong trend towards virtualization in engineering, whereby simulation replaces real testing in order to develop more quickly and cheaply, and gain more understanding of the system. System simulation is adopted in different phases of product development and is gaining importance within the entire product life cycle, since the design of future products is carried out based on simulation models.

In this context, the **Functional Mockup Interface (FMI)** defines a standardized interface to be used in computer simulations for the development of complex **cyber-physical systems (CPS)** resulting from an assembly of shared simulation units (FMU). FMUs are archives including executable artifact (.dll) and XML-based description of its interfaces. FMUs are then suitable for **model exchange (FMU4ME)** and **cooperative simulation (FMU4CS)**.



Thanks to the **Enterprise Architect FMI plugin**, existing graphical notation can be exploited (e.g., UML Diagrams) and customized (via Enterprise Architect MDG technologies) for the sake of model-based forward and reverse engineering of FMUs.

The mastering of cooperative simulation activities becomes possible by the graphical simulation and debugging of complex CPS.

Criteria for a good solution

- Simple and intuitive modeling and simulation operations.
- Direct integration of modeling and simulation models.
- Reuse of existing simulation models.
- Easy-to-install plugin for Enterprise Architect.
- Integration with other simulation environments (continuous simulations) is possible.

Implementation

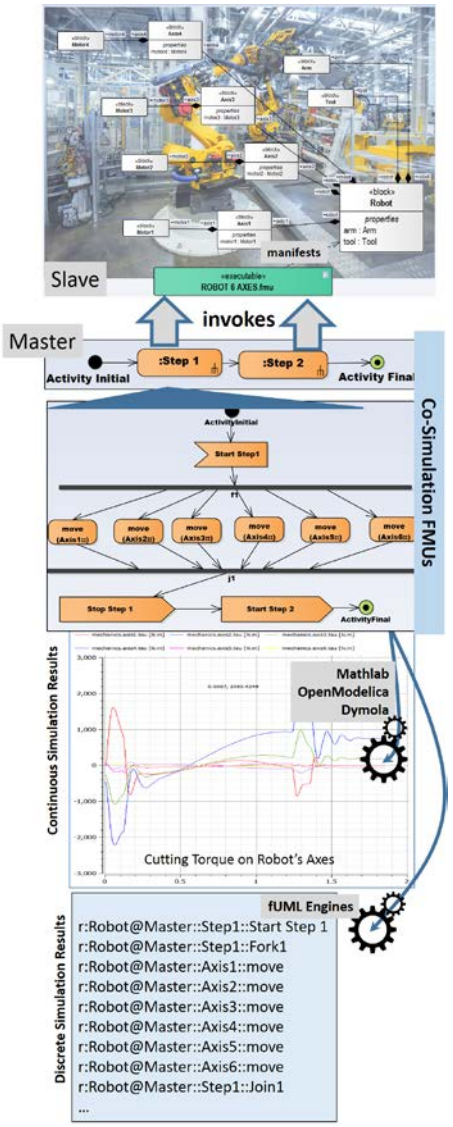
- Forward/Reverse Engineering of FMUs.
- Graphical modeling of FMU models (FMU4ME).
- FMU cooperative simulation through animated Enterprise Architect-based models (FMU4CS).
- Integration with existing EA-based technologies.

Benefits for Customers

- **Bridging** the gap between continuous and discrete **simulation tools**.
- **Exchanging executable models** without disclosing your intellectual property.
- FMUs can be **imported into and exported** from Enterprise Architect.
- Adoption of Enterprise Architect in **new usage scenarios**: model-based FMU engineering, FMU model validation, FMU model simulation.
- **Enterprise Architect FMI models can be directly connected to other technologies supported by Enterprise Architect.**
- A **graphical editor** in Enterprise Architect enables intuitive creating and FMI model editing

Example

A Robot is a compound mechanical unit including an Arm, a Tool, and six Axes, which in turn are equipped with their own Motor. A SysML Block Definition Diagram (using the SysML EA MDG Addin) models its architecture. The production process (represented as hierarchical UML Activities) consists of Processing Steps realized by the coordination of movements of Robot's Axes. **UML Activities** act **as master algorithm**: its Actions invoke **FMU executable artifact (as slave).** Analysis results (e.g., cutting torque applied on Axes) can be used to validate non-functional requirements (e.g., mechanical failures). The same Activities can also be part of executable UML Model supporting discrete simulation for the sake model validation.



Contact:

Priv.Doz. Dr. Manuel Wimmer
Head of Christian Doppler Module, TU Wien
wimmer@big.tuwien.ac.at
www.big.tuwien.ac.at/staff/mwimmer

www.sysml4industry.org

Peter Lieber, LieberLieber
peter.lieber@lieberlieber.com
www.lieberlieber.com

TU WIEN

LieberLieber

ENTERPRISE ARCHITECT