

FMI & COSIMULATION

Asbjørn Lykke Ditlev, MSc Student @ ECE, AU

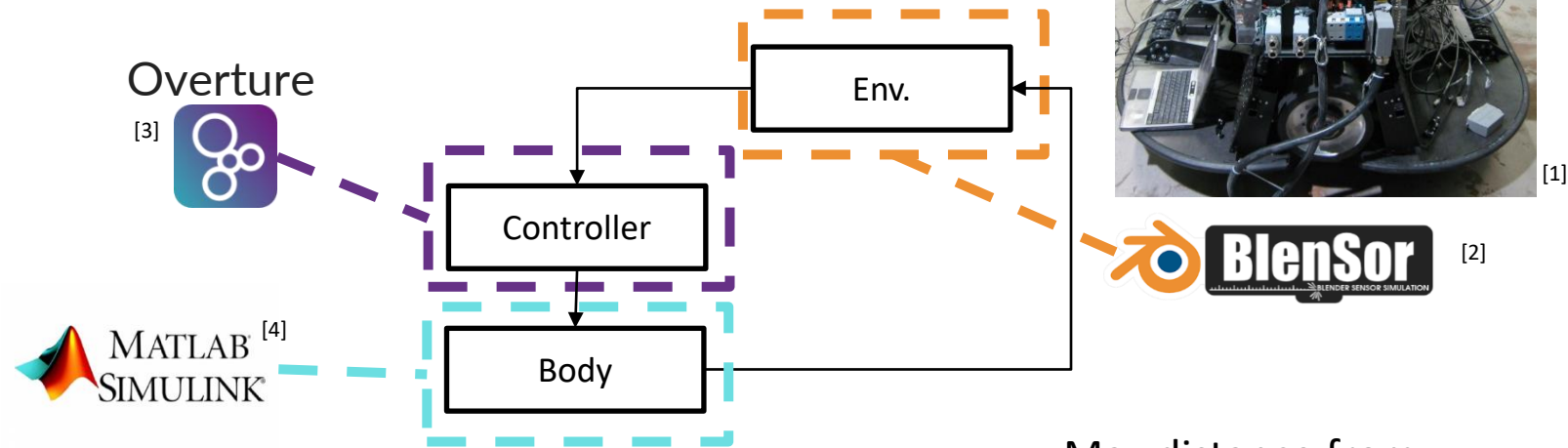
Bastian Aron Kramer, MSc Student @ ECE, AU

Cláudio Gomes, Assis. Prof. @ ECE, AU

Emil Hu, MSc Student @ ECE, AU

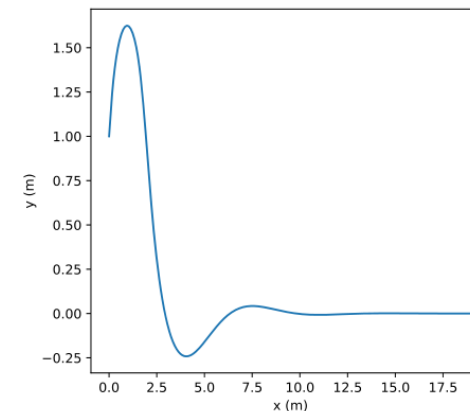
Lisa Maria Huynh, MSc Student @ ECE, AU

OBJECTIVE



A technique to combine
simulators to approximate
ideal solution [5].

Max distance from
optimal path?
Max acceleration?
Battery performance?



[1] Case Study by Kristof Berx , Davy Maes, and Klaas Gadeyne, from Flanders Make

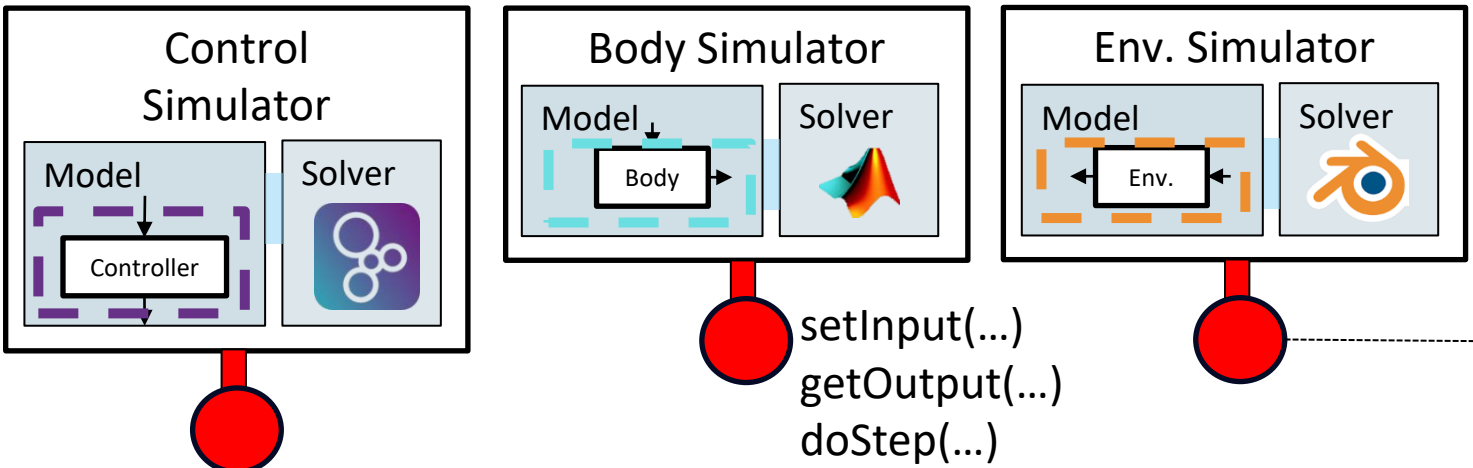
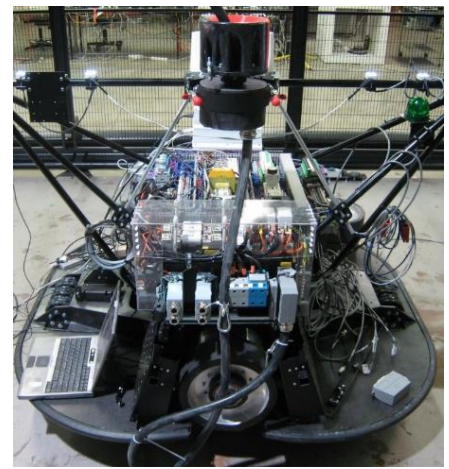
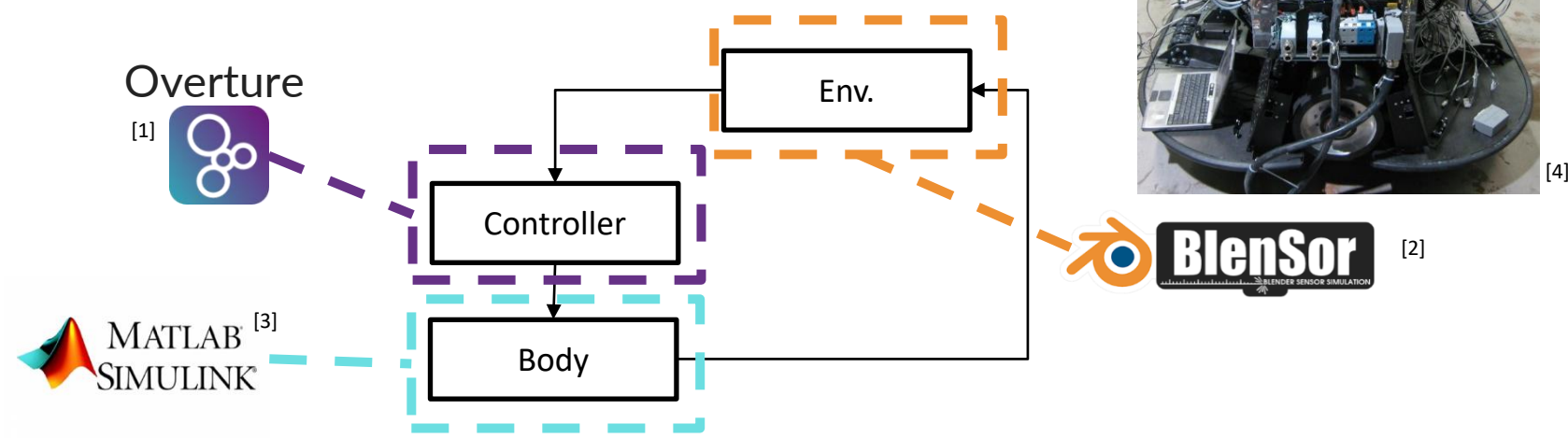
[2] <http://www.blensor.org/>

[3] <http://overturetool.org/>

[4] <https://nl.mathworks.com/products/simulink.html>

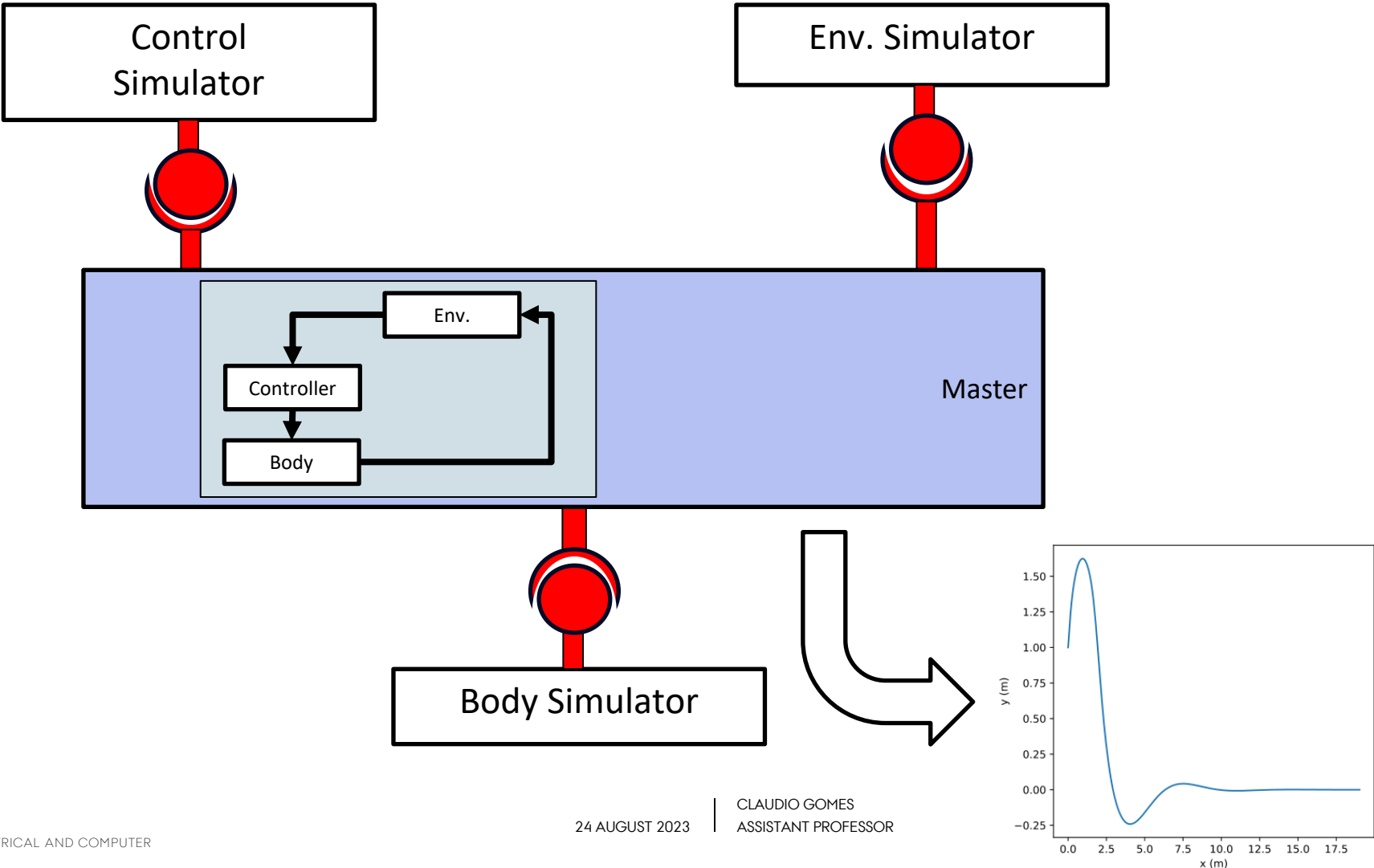
[5] Kübler, R., and W. Schiehlen. 2000. "Two Methods of Simulator Coupling." *Mathematical and Computer Modelling of Dynamical Systems* 6 (2): 93–113. [https://doi.org/10.1076/1387-3954\(200006\)6:2;1-M;FT093](https://doi.org/10.1076/1387-3954(200006)6:2;1-M;FT093).

CO-SIMULATION: INTERFACES

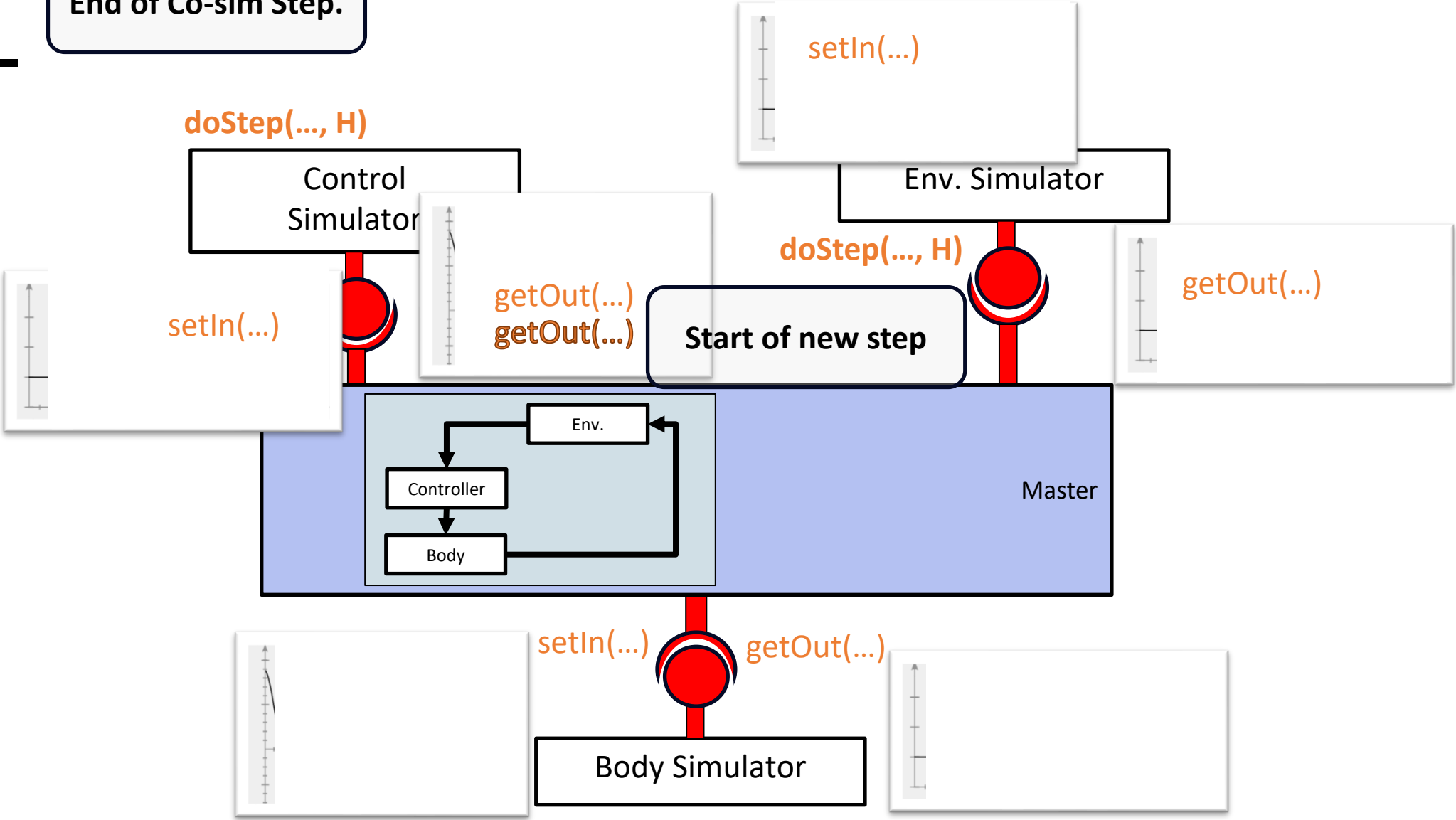


fmi Functional Mock-up Interface

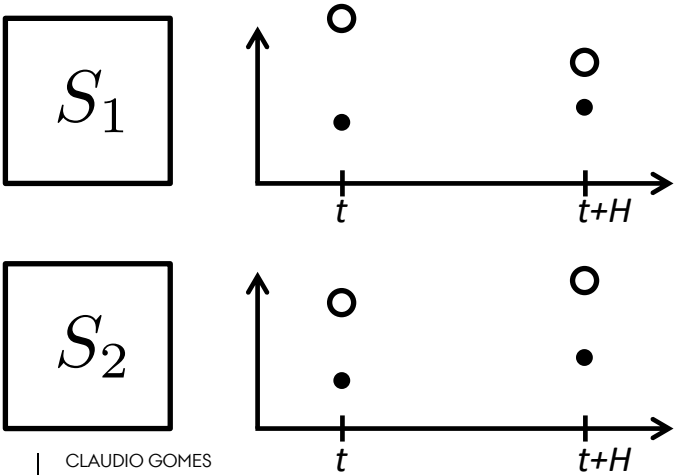
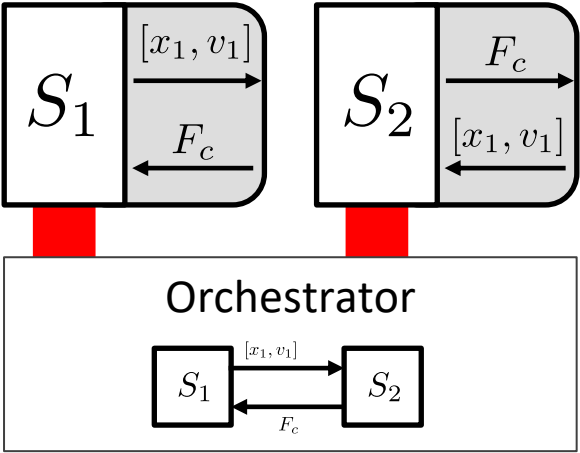
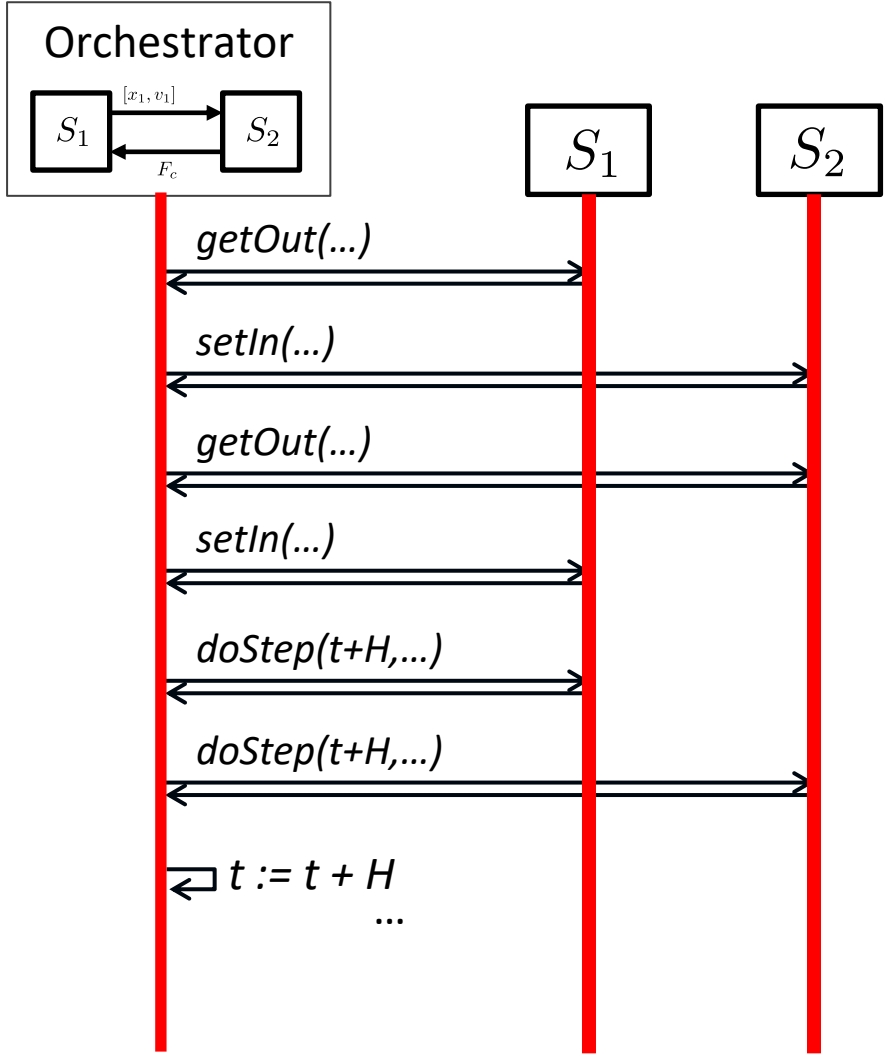
ORCHESTRATION ALGORITHM



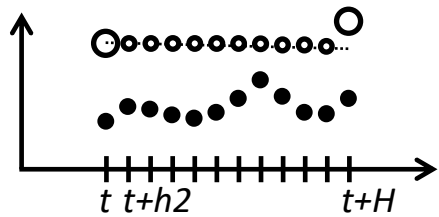
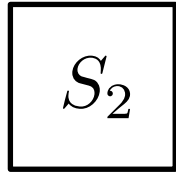
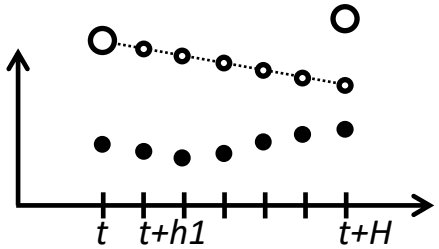
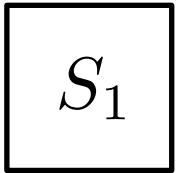
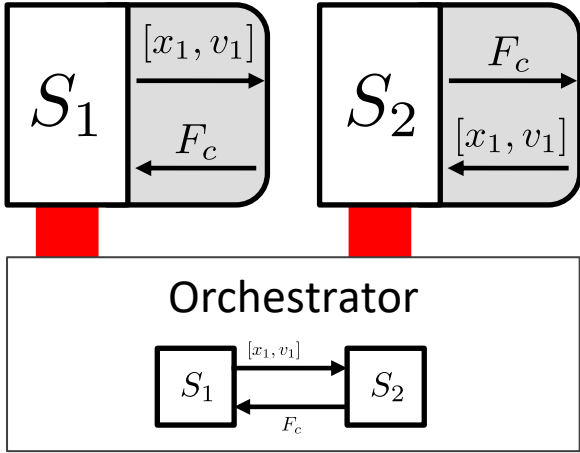
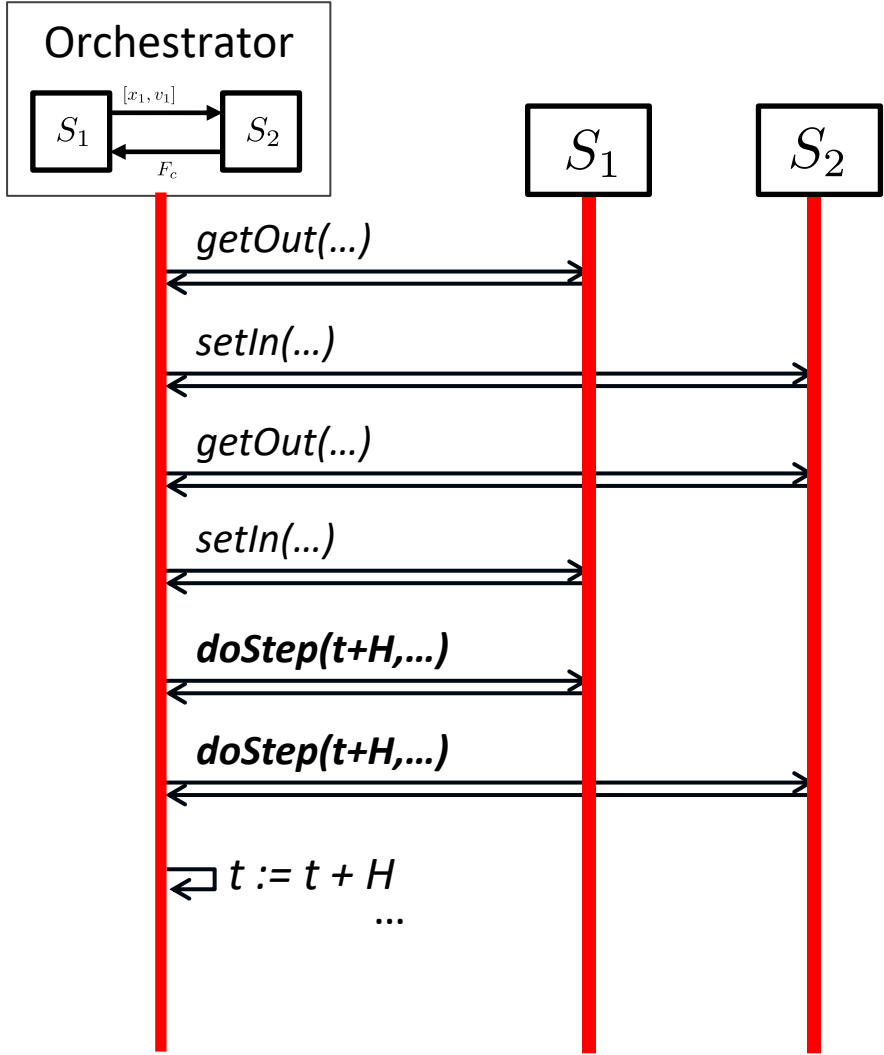
End of Co-sim Step.



ORCHESTRATION



INTERNAL BEHAVIOR



FMI STANDARD

Proposed in 2010 (v1.0).

Improve MBD between OEM <-> Supplier

Two interfaces:

- **Co-simulation**
- **Model Exchange**

Functional Mockup Interface 2.0: The Standard for Tool independent Exchange of Simulation Models

T. Blochwitz¹, M. Otter²,
J. Akesson³, M. Arnold⁴, C. Clauß⁵, H. Elmqvist⁶
M. Friedrich⁷, A. Junghanns⁸, J. Mauss⁸, D. Neumerkel⁹, H. Olsson⁶, A. Viel¹⁰
Germany: ¹ITI GmbH, Dresden; ²DLR Oberpfaffenhofen; ⁴University of Halle, ⁵Fraunhofer
IIS EAS, Dresden; ⁷SIMPACT, Gilching; ⁸QTronic, Berlin; ⁹Daimler AG, Stuttgart;
Sweden: ⁶Dassault Systèmes, Lund; ³Modelon, Lund;
France: ¹⁰LMS Imagine, Roanne

Abstract

The Functional Mockup Interface (FMI) is a tool independent standard for the exchange of dynamic models and for Co-Simulation. The first version, FMI 1.0, was published in 2010. Already more than 30 tools support FMI 1.0. In this paper an overview about the upcoming version 2.0 of FMI is given that combines the formerly separated interfaces for Model Exchange and Co-Simulation in one standard. Based on the experience on using FMI 1.0, many small details have been improved and new features introduced to ease the use and increase the performance especially for larger models. Additionally, a free FMI compliance checker is available and FMI models from different tools are made available on the web to simplify testing.

Keywords: *Simulation; Co-Simulation, Model Exchange; Functional Mockup Interface (FMI); Functional Mockup Unit (FMU);*

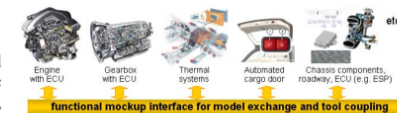


Figure 1: Improving model-based design between OEM and supplier with FMI.

The MODELISAR project ended in Dec. 2011. The maintenance and further development is now performed by the Modelica Association in form of the Modelica Association Project FMI (see <https://www.modelica.org/projects>). FMI was initiated and organized by Daimler AG with the goal to improve the exchange of simulation models between suppliers and OEMs. The further FMI development is performed by 16 companies and research institutes (see Annex). The FMI project is open for FMI interested persons¹ and for (Modelica and non-Modelica) tool vendors supporting FMI.

In this article an overview about the upcoming

DEMO: AN FMU

Exporting FMU from open modelica, and inspecting its contents.



DEMO: A COSIMULATION

Running a Co-simulation using Maestro CLI



