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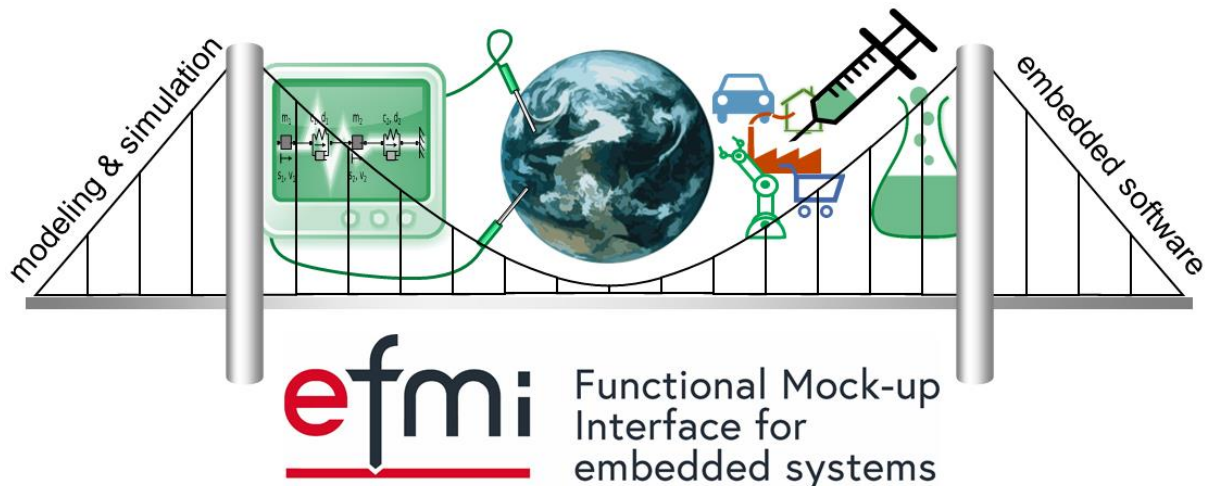
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# Modelica Association Project Functional Mock-up Interface for embedded systems (MAP eFMI)

## Annual report

### *Fiscal year 2023*



## Preamble

The main purpose of the “Modelica Association Project Functional Mock-up Interface for embedded systems” (MAP eFMI) is the development, standardization and promotion of the *eFMI Standard*. The *eFMI Standard* is an open standard for step-wise development and validation of advanced control functions suited for safety-critical and real time targets. It enables the application of high-level abstraction and simulation models – like acausal physics models – in embedded software by providing a container architecture for the step-wise refinement of a first high-level algorithmic solution to an embedded implementation on a dedicated target environment. The eFMI container architecture and respective eFMI tooling capture all activities of such a credible model transformation process:

- behavior / reference results for testing (Behavioral Model containers)
- target-independent bounded algorithmic solution (Algorithm Code container) based on eFMI GALEC (guarded algorithmic language for embedded control)
- C implementations, tailored and optimized for the requirements of specific target environments (Production Code containers)
- binary distributions and their „build-recipes“, ready for embedded system integration (Binary Code containers)

This report outlines the activities of MAP eFMI between June 2023 (including) and May 2024 (including).

## Current members of the MAP

The project has 6 Steering Committee members and 9 Advisory Board members:



|                       |  |
|-----------------------|--|
| Project Leader        | Christoff Bürger (Dassault Systèmes)   |
| Deputy Project Leader | Hubertus Tummescheit (Modelon)   |
| Steering Committee    | Dassault Systèmes<br>German Aerospace Center DLR<br>dSPACE GmbH<br>Mercedes-Benz AG<br>Modelon AB<br>Robert Bosch GmbH   |
| Advisory Board        | Altair Engineering Inc.<br>e:fs TechHub GmbH (former: Elektronische Fahrwerksysteme GmbH)<br>ESI Group<br>ETAS GmbH<br>Institute of Vehicle Engineering CO LTD<br>Mitsubishi Electric Research Laboratories<br>Open Source Modelica Consortium<br>PikeTec GmbH (part of Synopsys, Inc.)<br>Siemens Digital Industries Software |

Note, that ESI Group moved from Steering Committee membership to Advisory Board.

All members are also Modelica Association (MA) members; this is required by the project bylaws.

36 projectmen (individuals of member organizations) have access to the IT infrastructure and contribute to the MAP.

## Meetings

12 Steering Committee meetings since June 2023.

Regular Steering Committee meetings every first Tuesday each month at 15:00 CET.

Time-limited, dedicated workgroup meetings (design and specification of *eFMI Standard*, *eFMI\_TestCases* library and eFMU crosschecks etc.).

Since November 2023: Regular meetings within third-party research project OpenSCALING.

## IT infrastructure and resources

All members signed the Modelica Association Contributor License Agreement (MA CLA); this is required by the project bylaws. All public repositories are protected by CLA assistant.

The IT infrastructure provided by MAP eFMI is (new marked in red):

|   |  |
|---|--|
| <a href="mailto:efmi-info@googlegroups.com">efmi-info@googlegroups.com</a>  | Public e-mail list.  |
| <a href="mailto:efmi-standard@googlegroups.com">efmi-standard@googlegroups.com</a>                                  | Private e-mail list for members of the MAP.  |
| <a href="https://efmi-standard.org/">https://efmi-standard.org/</a>   | Public website with introduction, officially released tools listing, standard releases (Alpha 4 draft of eFMI Standard 1.0.0), and many resources like teaser videos and papers, example eFMUs, project organization documents like bylaws, membership application guidelines and forms etc. |
| <a href="https://github.com/EMPHYSIS/EMPHYSIS.github.io">https://github.com/EMPHYSIS/EMPHYSIS.github.io</a>         | Deprecated old public website of the EMPHYSIS project, now summarizing EMPHYSIS specific results only and otherwise pointing to the new MAP eFMI website.  |
| <a href="https://github.com/EMPHYSIS/efmi-specification">https://github.com/EMPHYSIS/efmi-specification</a>         | Private GitHub repository with specification sources.  |
| <a href="https://github.com/modelica/efmi-organization">https://github.com/modelica/efmi-organization</a>           | Private repository with MAP eFMI organization-internal resources, e.g., organization documentation, meeting minutes and sources of bylaws and promotion material.  |
| <a href="https://github.com/modelica/efmi-testcases">https://github.com/modelica/efmi-testcases</a>                 | Public GitHub repository with official eFMI test cases (eFMI_TestCases Modelica library) for demonstrating and evaluating eFMI tooling (used by eFMI crosschecks).   |
| <a href="https://github.com/modelica/efmi-containermanager">https://github.com/modelica/efmi-containermanager</a>   | Public repository of the <i>eFMI Container Manager</i> , a tool for creating, checking, reading and modifying eFMUs and their individual containers.   |
| <a href="https://github.com/modelica/efmi-compliancechecker">https://github.com/modelica/efmi-compliancechecker</a> | Public repository of the <i>eFMI Compliance Checker</i> , a tool for analyzing eFMUs for violations against the eFMI Standard.   |
| <a href="https://github.com/EMPHYSIS/efmi-crosschecks">https://github.com/EMPHYSIS/efmi-crosschecks</a>             | Private, NDA protected repository with crosscheck eFMUs generated from the official test cases.  |

## Main activities from June 2023 – May 2024

- eFMI Standard 1.0.0 Beta 1 release (2024-06-04), focusing and finalizing eFMI Behavioral Model representation.
- eFMI® trademark registered.
- A lot of new promotional material, most online available on the *Resources* subpage of the eFMI website at <https://efmi-standard.org/resources/>:
  - 2.5h tutorial at the 15<sup>th</sup> International Modelica Conference (October 2023) with hands-on in Dymola, Software Production Engineering and TargetLink. Check it out on YouTube: <https://www.youtube.com/watch?v=oCDH-8mXeNw>.
  - ITEA Magazine Issue 47 (March 2024) article, ITEA Success story article about EMPHYSIS and eFMI®: <https://itea4.org/magazine/47/march-2024/itea-success-story-emphasis.html>.
  - Modelica Newsletter articles.
- New/updated commercial eFMI tool releases, backed by *rigorous* eFMI crosschecks based on the public eFMI\_TestCases Modelica library:
  - **Dymola 2024x Refresh 1**, now with Behavioral Model container support (Dassault Systèmes)
  - **Software Production Engineering 2024 FD02** (former name CATIA ESP), now on 3DEXPERIENCE® (Dassault Systèmes)
  - **TargetLink 23.1** (dSPACE GmbH)
  - **TPT 20** (PikeTec GmbH, part of Synopsys, Inc.)

## Planned activities for 2024

- Further beta releases of eFMI Standard 1.0.0 (each beta focusing and finalizing one eFMI model representation/container type).
- Promotion of released commercial tools; support for industrial users.
- Promotion of eFMI technology to potential users and tool vendors.
- Support and collaboration with OpenSCALING research project.

## Budget 2023

- 0 EUR: eFMI trademark and website-template are financed separately by the Modelica Association.

## Budget proposal 2024+

- 7000 EUR: Discretionary Fund.
- 515 EUR: Single user XML Spy Professional license without support contract (used to produce XSD figures of *eFMI Standard*).

Date: 2024-05-28

Christoff Bürger (project leader)  
Hubertus Tummescheit (deputy project leader)