

Public SSB Fact Sheet: Functional Mockup Interface (FMI)

Projects

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Short description/ Transmitted information	<ul style="list-style-type: none"> FMI defines an API (Application Programming Interface) and a data file format FMI specification is freely available under a CC-BY-SA (Creative Commons Attribution-ShareAlike 4.0 International) license, header file is under BSD license
Normative document	<ul style="list-style-type: none"> Functional Mock-up Interface (fmi-standard.org)¹
Version / Release state	<ul style="list-style-type: none"> FMI 3.0
Release date	<ul style="list-style-type: none"> 2022-05-10
Application scope	<ul style="list-style-type: none"> Describe system behaviour of physics, mechatronics, and software Describe causal physical and signal relations
Goals	<ul style="list-style-type: none"> Standardized exchange format for behaviour models Multi-physics co-simulation Verification-oriented
Promoting bodies	<ul style="list-style-type: none"> VDA, prostep ivip, JSAE Japan Soc., Modelica Association
Type	<ul style="list-style-type: none"> Modelica Standard, prostep ivip Recommendation
IT Standard classification	<ul style="list-style-type: none"> Interoperability Standard Integration Standard
Data format	<ul style="list-style-type: none"> Text Format (ASCII/XML) Binary Format Compressed (Container-Data)

¹ <https://fmi-standard.org/>

<p>Additional available resources</p>	<ul style="list-style-type: none"> • Many web information resources, e.g. https://fmi-standard.org² • Use Cases, Guidelines, Best Practice Examples • Literature (Books, Scientific Papers) • Best Practices • Smart Systems Engineering (SmartSE), see www.prostep.org³ <div style="border: 1px solid gray; padding: 10px; margin: 10px 0;">  <p>Sorry, the widget is not supported in this export. But you can reach it using the following URL:</p> <p>https://www.youtube.com/watch?v=A-3ilot0fO8</p> </div> <p>see https://www.youtube.com⁴ keywords: functional mockup interface or /watch?v=A-3ilot0fO8</p>
<p>Relevant prostep ivip project groups</p>	<p>Smart Systems Engineering Group⁵</p>

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Additional Resources

- The only standard for exchange of simulation models and co-simulation
- Needed for interdisciplinary multi-physics and software Simulation (virtual and mixed verification)

² <https://fmi-standard.org/>

³ <http://www.prostep.org/>

⁴ <https://www.youtube.com/>

⁵ <https://intranet.prostep.org/display/PROJ/Smart+Systems+Engineering>

1 Remark:

- FMI is based on the ITEA modelisar project which achieved 2012 the ITEA award in silver
- FMI was supported in 2014 by approximately 60 tools and is currently supported by 141 tools (as of Feb. 2020)
- FMI is further developed and standardized by the Modelica Association Project FMI

2 Reached goals:

- FMI can be used for model exchange and for co-simulation (if implemented by the tool)
- FMI Cross Check Rules for quality improvement of tool implementation
- Well-defined development process for further FMI versions (by the Modelica Association Project FMI)
- Best practice guide for FMI users (developed by the prostep ivip SmartSE project)
- Endorsed in prostep ivip SmartSE Recommendation V2 (PSI 11 – Smart Systems Engineering - Simulation Model Exchange; available at www.prostep.org⁶)
- Industrial standard, in industrial use
- Supported by at least 141 CAE tools (authoring tools, co-simulation platforms, optimization tools, HiL, SiL platforms)
- Process improvements (templates, guidelines, best practices, contributions to FMI 3.0)

⁶ <http://www.prostep.org/>

3 Further goals

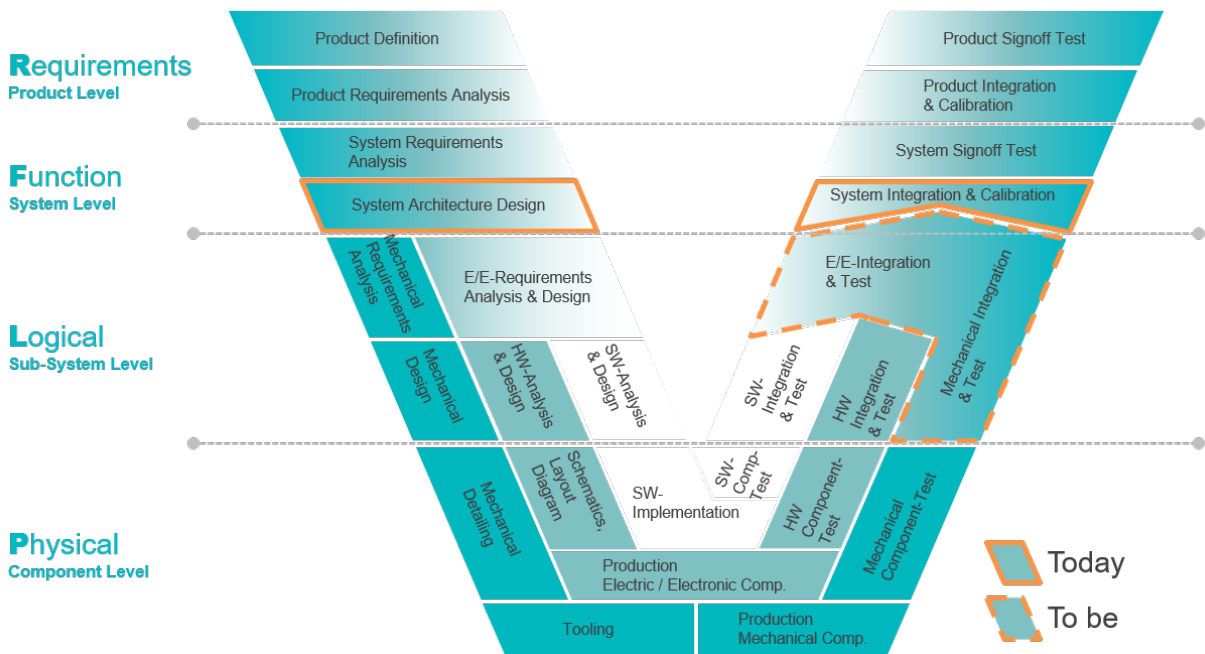
- Further improvement of usability and applications range by new features
- Extension of FMI cross check from single to connected FMUs in a way that this is consistent with the Modelica Association Project SSP (System Structure and Parameterization of Components for Virtual System Design)

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Positioning of FMI in V-Model



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- In the context of MBSE FMI is required for behaviour and software behaviour modeling

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Additional Resources

- Development efforts need to be split among several FMI versions, slowing down overall adoption rate of the standard

- Users keep using older versions of the standard; therefore tool vendors have no incentive to implement newer versions for export
- Releases of non-backward compatible versions cause transition overhead for users, slowing down the adoption of new releases
- A simulation model using multiple FMU’s from different IT tools may not leverage the full FMI capabilities if one (or more) IT tool(s) do not support all capabilities of the FMI specification. This can lead to unexpected simulation results.

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Datei	Geändert
Fact Sheet_ Functional Mockup Interface (FMI).pdf ⁷	Apr. 05, 2023 by Peter Tabbert ⁸
Positioning of FMI in V-Model.png ⁹	Apr. 05, 2023 by Peter Tabbert ¹⁰
image2019-10-1_7-56-28.png ¹¹	Apr. 05, 2023 by Peter Tabbert ¹²

7 https://intranet.prostep.org/download/attachments/110329887/Fact%20Sheet_%20Functional%20Mockup%20Interface%20%28FMI%29.pdf?api=v2

8 <https://intranet.prostep.org/display/~petertabbert>

9 <https://intranet.prostep.org/download/attachments/110329887/Positioning%20of%20FMI%20in%20V-Model.png?api=v2>

10 <https://intranet.prostep.org/display/~petertabbert>

11 https://intranet.prostep.org/download/attachments/110329887/image2019-10-1_7-56-28.png?api=v2

12 <https://intranet.prostep.org/display/~petertabbert>