Recent and Future FMI & SSP Developments in OpenModelica

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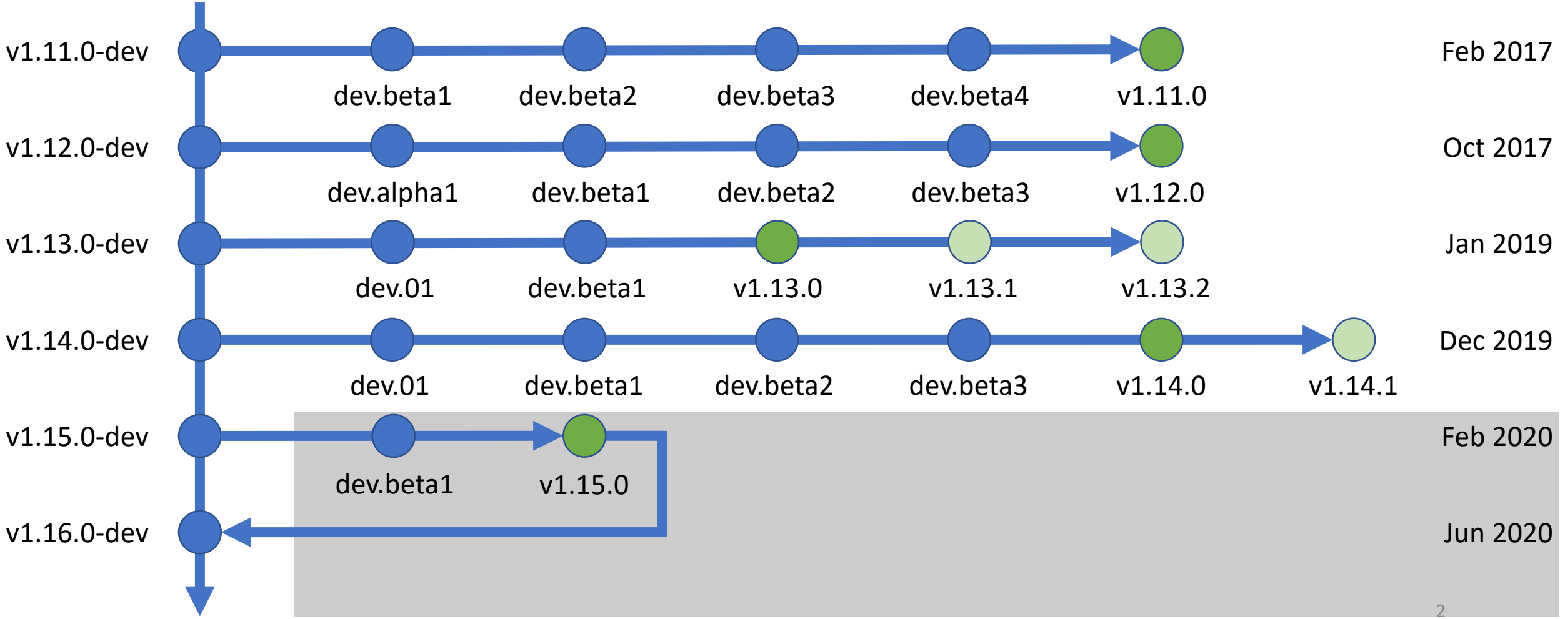
RISE OpenModelica

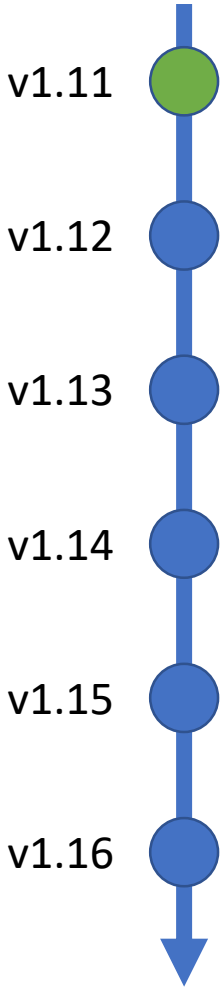
OpenModelica Releases Overview



OpenModelica Releases Overview

v1.11	Synchronous language elements / DAE mode / C++ FMI export	Feb 2017
v1.12	ZeroMQ / OMSimulator	Oct 2017
v1.13	OMSimulator 2.0 / encryption / Julia scripting API / Analytic directional derivatives for FMI 2.0 export	Jan 2019
v1.14	New Frontend (--newInst required, replaceable not supported)	Dec 2019
v1.15	New Frontend (OMEdit GUI functionality for replaceable)	Feb 2020
v1.16	FMI export / SSP import & export / …	Jun 2020

FMI Export



Ticket	Type	Priority	Summary
4183	Defect	Blocker	Generated FMUs on Windows are missing libstdc++-6.dll
3599	Defect	High	fmiInitialize crash - stack alignment assumption incorrect

Feb 2017

Oct 2017

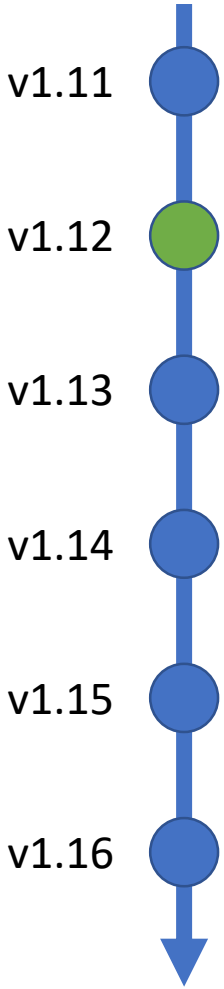
Jan 2019

Dec 2019

Feb 2020

Jun 2020

FMI Export



Ticket	Type	Priority	Summary
4562	Defect	High	Fix default nominal attribute in FMUs
4529	Defect	Critical	[c runtime] FMI setReal/getReal doesn't work
4479	Defect	High	FMU source build fails due to missing lambda functions
4192	Defect	High	Cannot set discrete inputs for Co-Simulation FMU

Feb 2017

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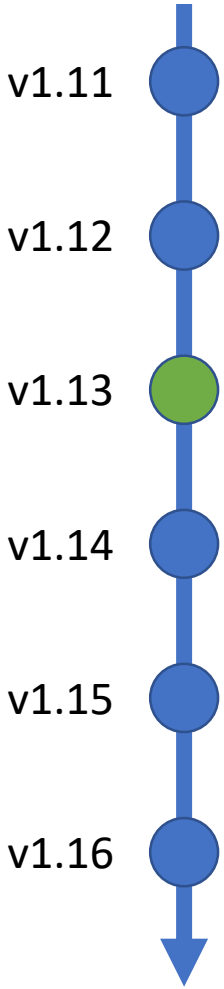
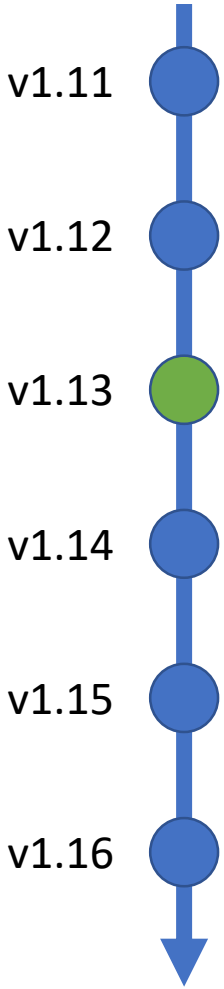
FMI Export



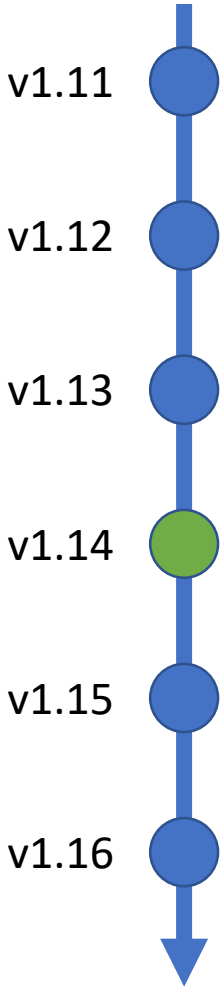
Ticket	Type	Priority	Summary	
5221	Defect	Critical	FMU CS 2.0 sometimes drops events when multiple ones occur between adjacent step times	Feb 2017
5219	Defect	Blocker	Wrong outputs in modelDescription.xml	Oct 2017
5117	Defect	Blocker	Cannot load exported FMUs in fmuCheck due to missing required DLLs	Jan 2019
5035	Defect	High	FMI export produces non-FMI-compliant FMUs	
4991	Defect	Critical	Too many simulations fail with too long a timeout in the TEST_LIBS_FMI_MASTER Hudson job	Dec 2019
4977	Defect	High	Directional derivatives error (FMU for model exchange)	Feb 2020
4951	Defect	Blocker	OMEdit did not generate the fmu file on FMU export	
4675	Defect	Blocker	Statically link libstdc++ on Windows	Jun 2020
4424	Defect	Blocker	Wrong ModelStructure in FMI 2 modelDescription.xml	

FMI Export



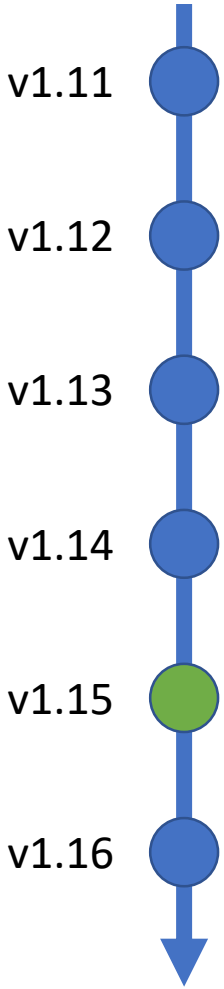
Ticket	Type	Priority	Summary	
4140	Defect	High	Questionable compiler options (-O0 -march=native) when building FMUs	Feb 2017
3903	Defect	Blocker	Generation of FMU broken for several ScalableTestSuite models	Oct 2017
3865	Defect	High	OMEdit fails to import a 2.0 FMU that contains both ME and CS	
3749	Defect	High	Generated FMUs for C and CPP have different names	Jan 2019
3035	Defect	High	Rectifier FMU 1.0 in FMU Checker	
2764	Defect	High	ModelStructure with wrong dependencies for states and without dependencies for outputs	Dec 2019
5218	Defect	Blocker	Initialization issue with FMUs and C runtime	Feb 2020
5293	Defect	Blocker	buildModelFMU does not copy DLL libraries in binaries folder	
				Jun 2020

FMI Export



Ticket	Type	Priority	Summary	
5555	Defect	Blocker	FMI export broken if OpenModelica is installed in the Program Files directory	Feb 2017
5431	Defect	Blocker	FMU Unable to Find File on Resource Folder in Windows	Oct 2017
5420	Defect	High	All Opened Libraries Are Included in Resource Folder FMU	
4800	Defect	High	[FMI] For the module structure alias for output states are introduced invert them.	Jan 2019
2626	ENH	High	Support FMI co-simulation import	Dec 2019
				Feb 2020
				Jun 2020

FMI Export



Ticket	Type	Priority	Summary

+2 open issues

v1.11 Feb 2017

v1.12 Oct 2017

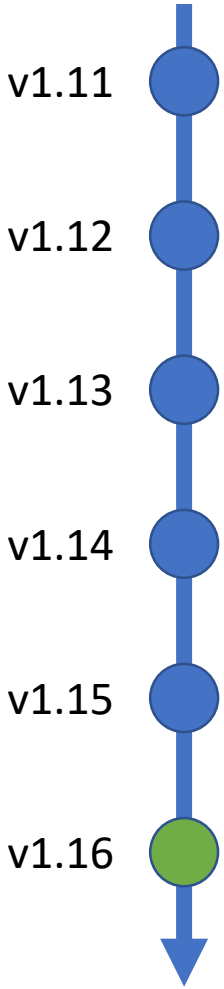
v1.13 Jan 2019

v1.14 Dec 2019

v1.15 Feb 2020

v1.16 Jun 2020

FMI Export



Ticket	Type	Priority	Summary
5761	Defect	High	Symbolic Jacobians not correct for Linearization and FMI
5670	Defect	Normal	FMU export with 'output Integer' not FMI conform
5586	ENH	Normal	FMU info
3786	Defect	Blocker	FMU export generates an empty ModelStructure
2765	Defect	High	Export of FMU 2.0 fails if parameters are used as start values
5802	Defect	High	handling of causality="none" for FMI -2.0

+57 open issues

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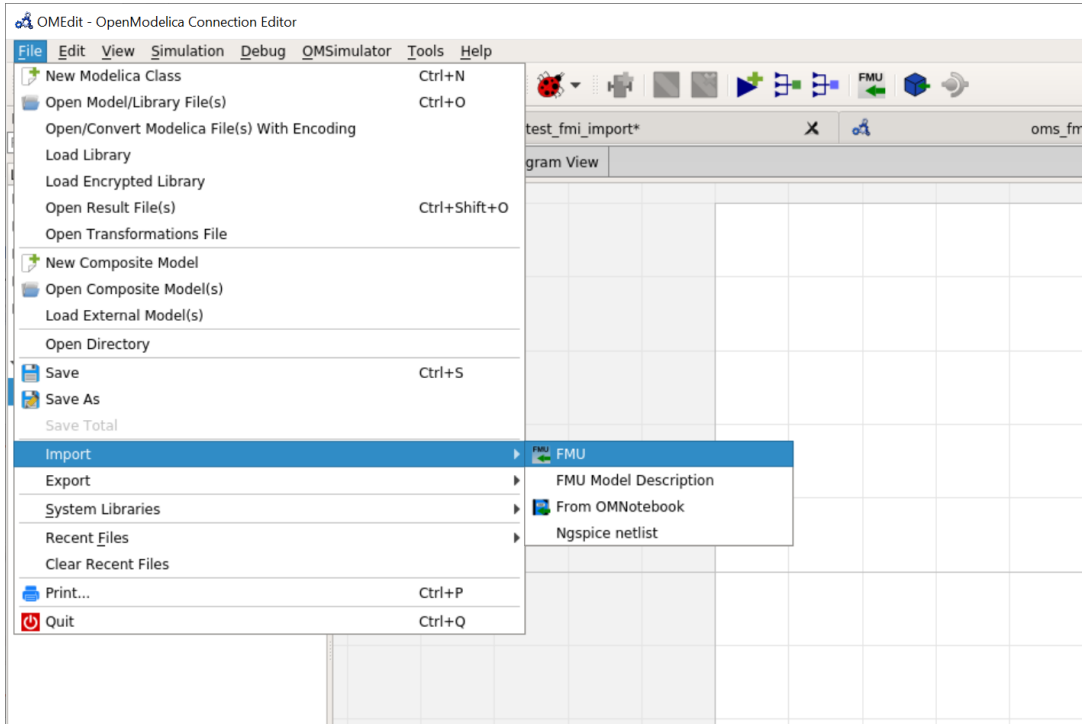
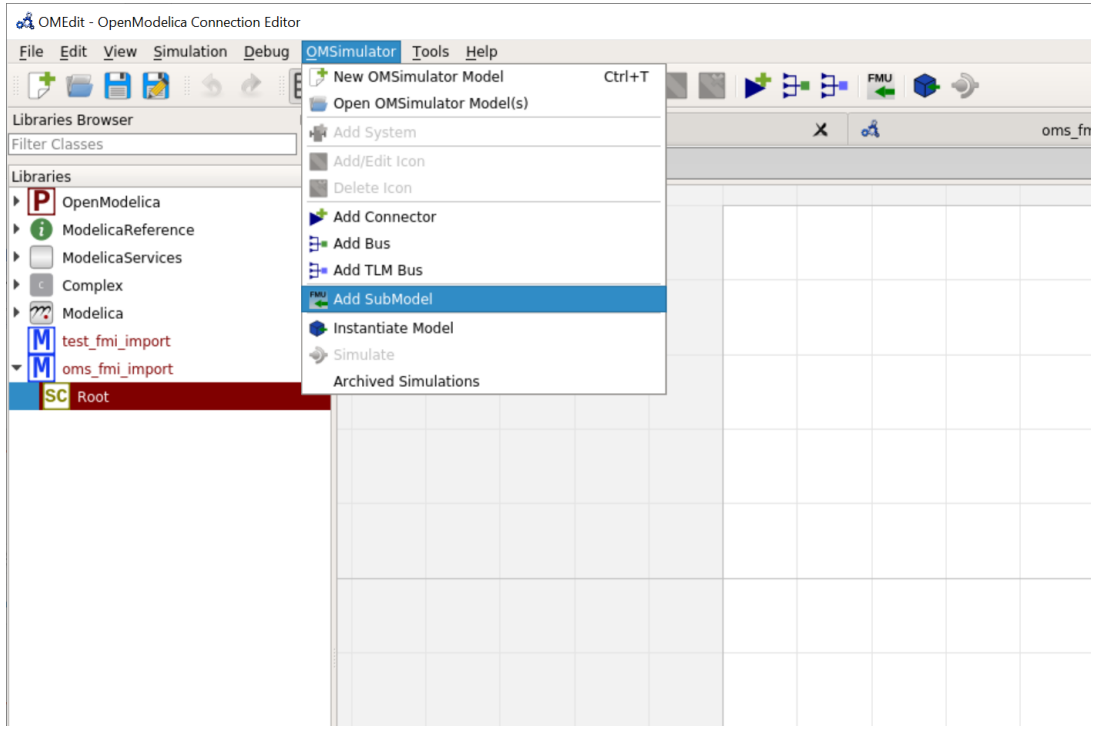
FMI Import

OMC



OMSimulator

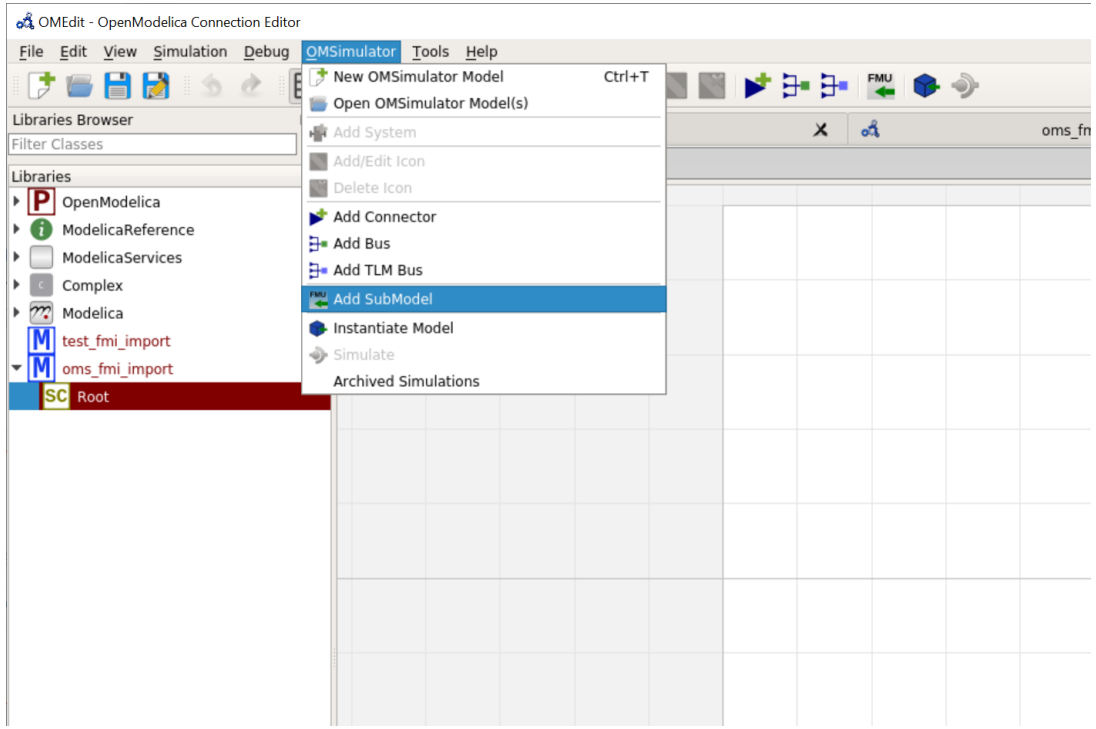


FMI Import

OMC

- Generates Modelica wrapper for the FMU
- Uses the external C interface
- Supports only model exchange
- Not portable?

OMSimulator



FMI Import

OMC

- Generates Modelica wrapper for the FMU
- Uses the external C interface
- Supports only model exchange
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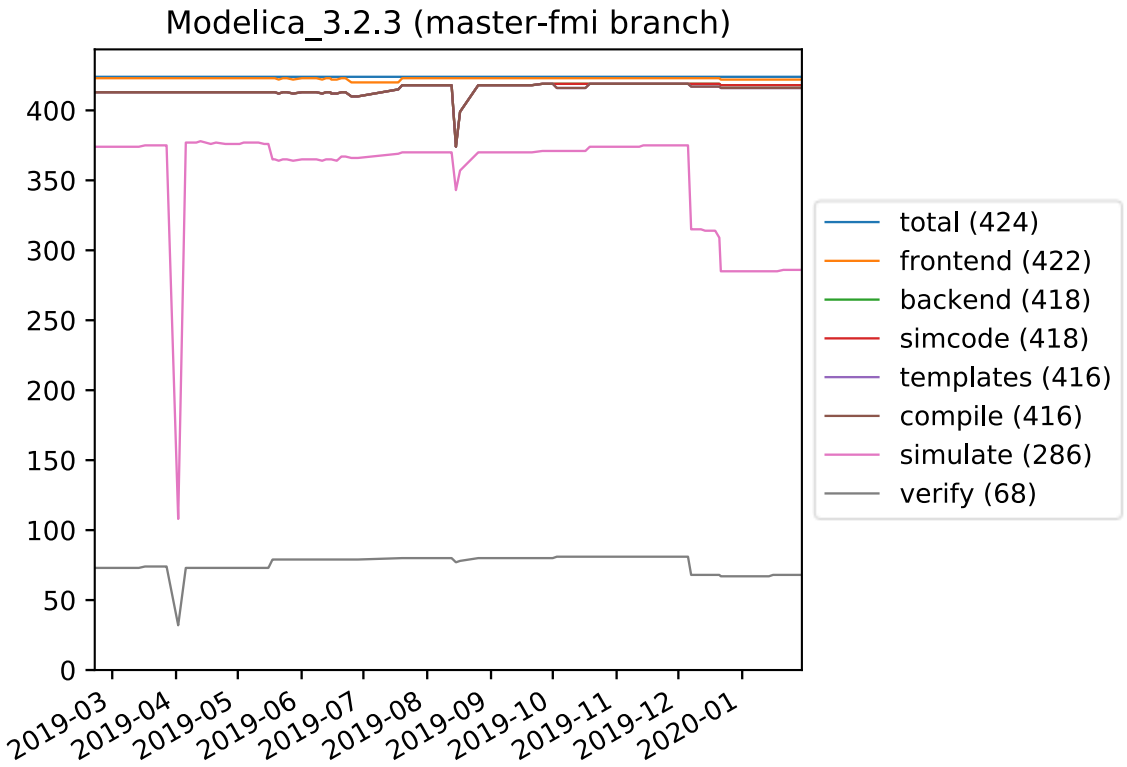
OMSimulator

- No wrapper code needed
- Uses SSP to describe composition
- Supports model exchange and co-simulation

Modelica 3.2.3 coverage (using OMSimulator)



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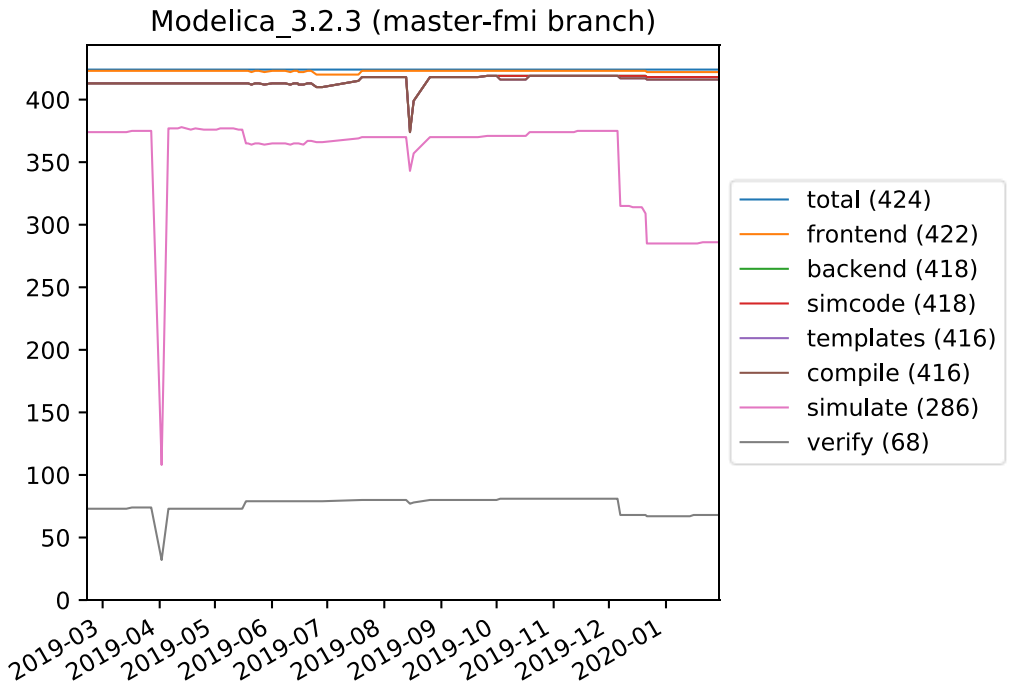


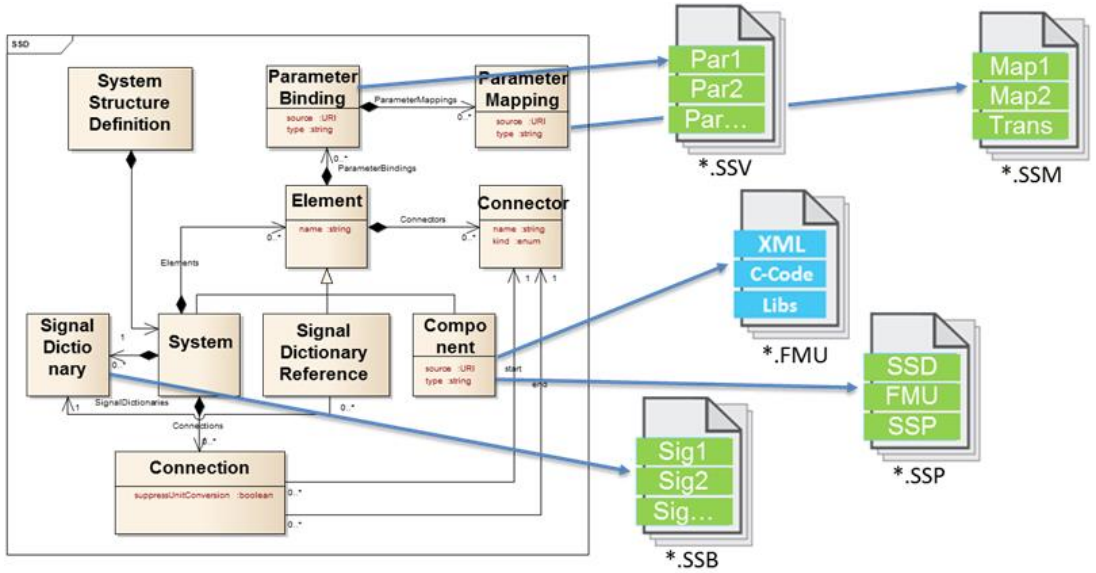
- ✓ Single FMU simulations
- ✕ FMI API (inputs, parameters, …)
- ✕ Composite models

SSP Export & Import (System Structure and Parameterization)

- Initial support of SSP in v1.13
- Pre-release version “Draft20180219”

Goals for v1.16

- Adapt to the official release of SSP 1.0



Future Developments: FMI 3.0

Ports and Icons

Help the user to build consistent systems from FMUs and render the systems more intuitively with better representation of structured ports (for instance busses and physical connectors) in the modelDescription.xml.

Array variables

Allow FMUs to communicate multi-dimensional variables and change their sizes using structural parameters.

Clocks and Hybrid Co-Simulation

Introduces clocks for synchronization of variables changes across FMUs. Allows co-simulation with events.

Binary Data Type

Adds an opaque binary data type to FMU variables to allow, for instance, efficiently exchanging of complex sensor data.

Intermediate Variable Access

Allow access to intermediate input and output values between communication time points from the FMU to disclose relevant subsystem behavior for analysis or advanced co-simulation master algorithms for enhanced numerical stability.

Source code FMUs

Adding more information to the modelDescription.xml file to improve automatic import of source code FMUs.

Numeric Variable Types

Adds 8, 16, 32 and 64-bit signed and unsigned integer and single precision floating point variable types to improve efficiency and type safety when importing / exporting models from the embedded, control and automotive domains.

Extra directory

Adding a new folder in the ZIP Archive representing an FMU, providing additional data to travel with the FMU which can be modified by different tools, allowing for layered standards

Future Developments: SSP 2.0

- Adaption to FMI 3.0 (e.g. ports, arrays)
- Modelica model as component
- Simulation information/setup
- Examples

Outlook

v1.16

- Become compliant to the current FMI standard
- Fix/Improve FMU logging
- Fix event handling
- Adapt SSP import/export to SSP 1.0

Future

- Performance, stability, accuracy
- FMI testing environment
- Deepen integration of omc and OMSimulator