
4th Annual OpenModelica Workshop

Feb 6, 2012

Workshop Opening

OpenModelica – Status and Directions

Peter Fritzson

To All Participants!

Very Welcome to this Fourth Annual OpenModelica Workshop!

Goals for the OpenModelica Effort

- Comprehensive **modeling, simulation and systems engineering** environment for research, teaching, and industrial usage
- **Open-source** for both **academic** and **industrial** usage
- Invitation for **open-source cooperation** around OpenModelica, tools, and applications

OpenModelica Web Page

OpenModelica Login · Create an account

HOME DEVELOPER FORUM DOWNLOAD CONTACT US WORKSHOP RESEARCH search...

Top information

 [OMEdit](#).
The new OpenModelica Connection Editor is released.

Registration

Please [register](#) if you download and install Open Modelica. Why? We would like to inform you about new releases of Open Modelica! We want be informed who is using it and the kind of usage. Your information will be not be distributed to third parties!

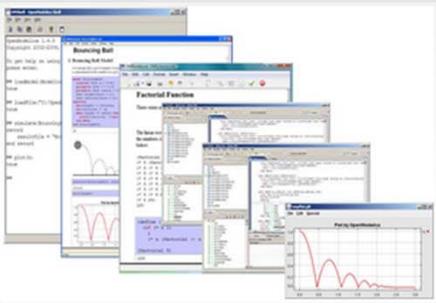
Note: It may take a while to be registered as we check the information we receive to fight the spam on our mailing lists.

Thank you for your patience.

Introduction

OPENMODELICA is an open-source Modelica-based modeling and simulation environment intended for industrial and academic usage. Its long-term development is supported by a non-profit organization – the [Open Source Modelica Consortium \(OSMC\)](#).

The goal with the OpenModelica effort is to create a comprehensive Open Source Modelica modeling, compilation and simulation environment based on free software distributed in binary and source code form for research, teaching, and industrial usage. We invite researchers and students, or any interested developer to participate in the project and cooperate around OpenModelica, tools, and applications.



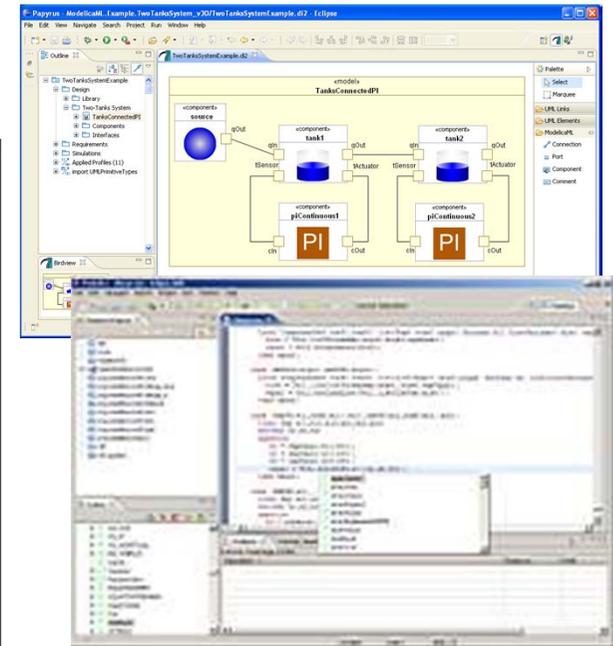
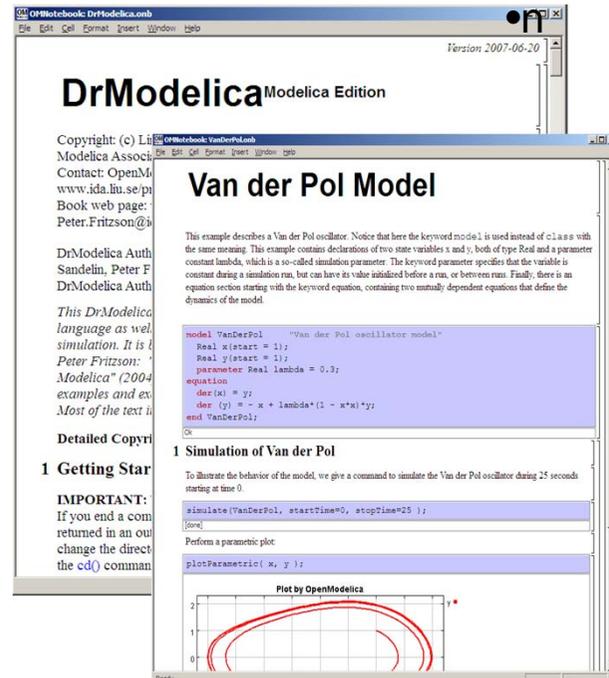
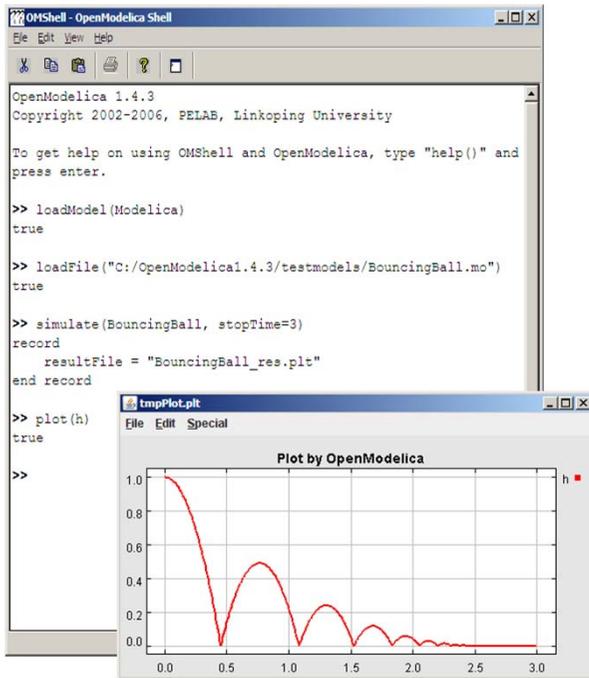
[Register yourself](#) to get information about new releases. Participate in the [OpenModelicaInterest mailing list](#). Help us: get the latest [source code](#) or [nightly-build](#) and report [bugs](#). To learn about Modelica, read a [book](#) or a [tutorial](#) about [Modelica](#). To do system modeling with integrated UML/Modelica, use [ModelicaML](#).

Latest news

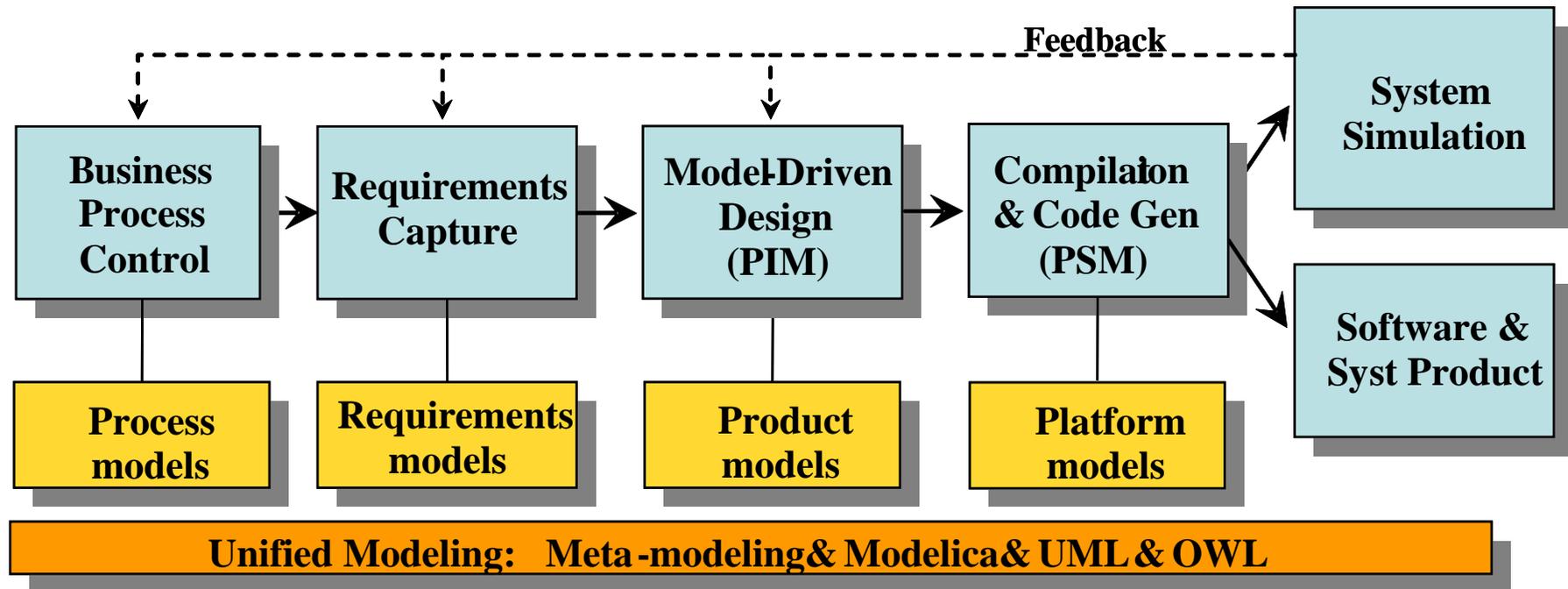
- Jan 30: OpenModelica 1.8.1 beta released
- January 22: Registration Open - MODPROD'2012 and OpenModelica'2012 workshops on Model-based development
- Nov 25: OpenModelica 1.8.0 released
- Nov 22 : Preliminary Program For OpenModelica Annual Workshop
- OpenModelica Developers Week - 7-11 November 2011
- Oct 13: CFP OpenModelica/MODPROD Workshops February 2012
- October 11 : OpenModelica 1.8.0 Beta2 release
- September 24: OpenModelica 1.8.0 Beta Release
- June 21: Next Modelica design meeting in Linköping, 31th August - 2nd September
- May 20: OMWeb Teacher and Student Clients Running Now

Current OpenModelica www.openmodelica.org

- **Advanced Interactive Modelica compiler (OMC)**
 - Supports most of the Modelica Language
- **Basic environment for creating models**
 - **OMShell** – an interactive command handler
 - **OMNotebook** – a literate programming notebook
 - **MDT** – an advanced textual environment in Eclipse
 - **ModelicaML** – UML Profile
 - **MetaModelica** – model transforms
 - **ParModelica** – parallel programming



Expanded Vision for OpenModelica Effort: Integrated Model-driven Development Based on OpenModelica, e.g. in OPENPROD project



Vision of unified modeling framework for model-driven product development from platform independent models (PIM) to platform specific models (PSM)

Main Events 2011

Outlook for 2012

Main Events 2011 and January 2012

- OSMC expanded from 32 to 38 organizational members
- OpenModelica **1.7 release** (April 2010)
 - Faster and more stable simulation through improved event handling
 - New optimization subsystem OMOptim
 - Improvements in OMEdit including support for icon editing
 - Faster simulation storage, including binary .mat files and alias variables
- OpenModelica **1.8 release** (Nov 2011)
 - Support for FMI Export and Import
 - Flattening of the whole MSL 3.1 Media library, and about half of the Fluid library.
 - Improved index reduction with dynamic state selection
 - Beta release of new efficient debugger for algorithmic Modelica/MetaModelica
- OpenModelica **1.8.1 beta release** (Jan 2012)
 - Operator Overloading support
 - Dramatically improved flattening speed for some models
 - Improved simulation run-time
 - ModelicaML with Modelica library import (MSL) and value-bindings

OpenModelica – Outlook for 2012

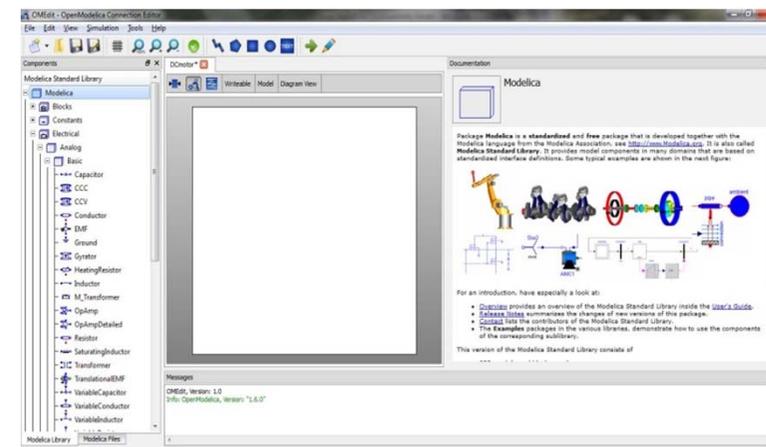
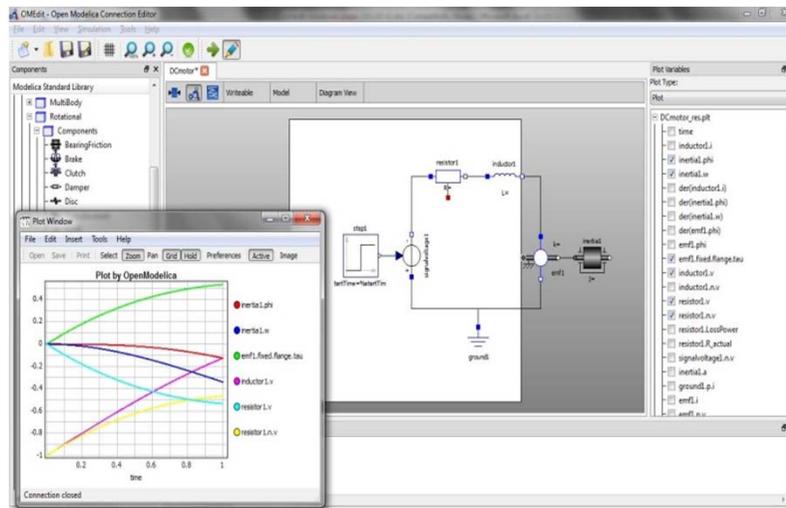
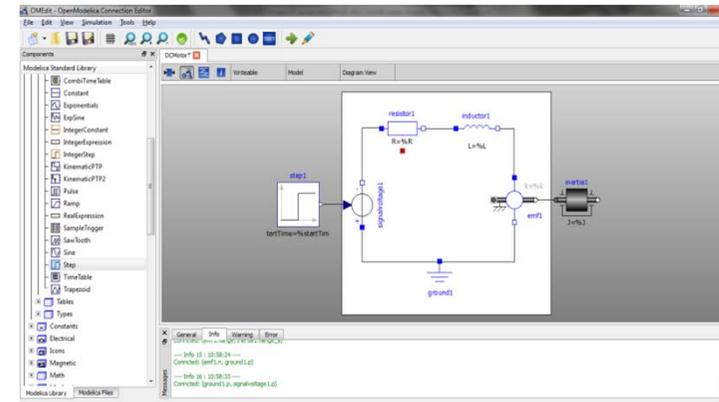
- Whole 2012. Continued high priority on better support for the Modelica standard libraries.
- Spring 2012. Support for larger models and improved simulation efficiency.
- February 2012. Shifting to bootstrapped OpenModelica compiler for development.
- February-March 2012. Parallel Modelica simulation, OpenMP, and ParModelica for GPU simulation prototypes
- March-April 2012. Most of Fluid library flattening and simulating
- March 2012. improved support for MultiBody simulation.
- April-June 2012. Most of Media and Fluid libraries simulating
- May-June 2012. Integrated Modelica debugger.
- May-June 2012. Python API
- Fall 2012. Support for Modelica 3.3

OpenModelica Compiler Bootstrapping

- Bootstrapping = OMC Compiler Compiles itself
- Advantages
 - **Faster** compilation for the developers
 - Complete Modelica language for **easier programming**
 - Better error messages and maintainability
 - Makes a faster Modelica **debugger** possible
 - Makes **performance** analysis possible
 - some **Modelica 4** like features
- Status
 - Dec 2010, OMC first compiled itself
 - During 2011, used for development with the new debugger
 - Feb-Mar 2012. Planned completion of automatic memory reclamation

Improved OpenModelica Connection Editor OMEdit

- Supports MSL 3.1
- Easy to use
- Stable
- Implemented in C++ Qt library



New Efficient OpenModelica MDT Debugger for Algorithmic MetaModelica/Modelica (Eclipse-based)

Here Using Japanese Characters

The screenshot displays the Eclipse IDE with the OpenModelica MDT Debugger. The main window title is "Debug - trunk/testsuite/mosfiles-nosim/QuotedFunction.mo - Eclipse SDK". The interface is divided into several sections:

- Debug Console (Left):** Shows the MDT GDB [Modelica Development Tooling (MDT) GDB] and the Main Thread (stepping) call stack. The current step is "オープンモデリッカー・ロック at quotedfunction.mo:5".
- Variables Panel (Right):** A table showing the current state of variables:

Name	Declared Type	Value
◆ キャン・ザー・デバガー・シー・ミー	Real	1.5
◆ イェス・イト・キャン	Real	-4.836697827222
- Source Code Editor (Bottom):** Shows the code for the function "オープンモデリッカー・ロック". A breakpoint is set on the line: `'イェス・イト・キャン' := sin('キャン・ザー・デバガー・シー・ミー');`
- Console (Bottom):** Shows the output of the debugger: `true` and `""`.

OpenModelica Optimization Subsystem OMOptim

- Parameter optimization
- Currently using genetic optimization algorithms in OMOptim 0.9.

Model structure

Model Variables

Optimized parameters

Optimized Objectives

MinEIT

File Project Problem Display Tools

Models Problems

Project Optimization EI EI result

Variables

Filter :

Name	Value	Description
global.sourceaudeville.h	1,18294e+06	[J/kg]
global.sourceaudeville.flowPort.p	100000	
global.sourceInEchColdB.h	1,41347e+06	[J/kg]
global.sourceInEchColdB.flowPort.p	100000	
global.sourceInEchColdB.debit	12,78	[kg/s]
global.sourceEffluentsECS.h	1,35495e+06	[J/kg]
global.sourceEffluentsECS.flowPort.p	100000	
global.sourceEffluentsECS.etat	1	
global.sourceEffluentsECS.debit1	0	
global.sourceEffluentsECS.debit	1	[kg/s]
global.sourceEffluentsB.h	1,35495e+06	[J/kg]
global.sourceEffluentsB.flowPort.p	100000	
global.sourceEffluentsB.etat	1	
global.sourceEffluentsB.debit	1,22612	[kg/s]
global.sourceEffluentsA.h	1,35495e+06	[J/kg]
global.sourceEffluentsA.flowPort.p	100000	
global.sourceEffluentsA.etat	1	
global.sourceEffluentsA.debit	0,601234	[kg/s]
global.scenarioEchA.debit	0,940001	[kg/s]
global.scenariodepartB.z	0	

Optimized variables

Name	Description	Opt. Minimum
global.sourceEffluentsB.debit	[kg/s]	0
global.sourceEffluentsA.debit	[kg/s]	0
global.scenarioPACB.MySpecPcomp		0
global.scenarioPACA.MySpecPcomp		0

Scanned variables

Name	Description	Scan Minimum	Scan Maximum	n
------	-------------	--------------	--------------	---

Optimization objectives

Name	Description	Direction	M
global.gaincouteoperationnel		Maximize	0
global.coutdinvestissement		Minimize	0

Variables Components Launch

Prototypes of Parallel Execution with OpenModelica

- ParModelica – Parallel Algorithmic Modelica Code Execution on GPU
 - Speedup factor 114 of matrix multiplication on NVIDIA Fermi GPU
- OPENMP support in OpenModelica, parallelization of partitioned models
 - Speedup factor 4 of trivial model on 4-core machine

The Open Source Modelica Consortium

Purpose of the Consortium

- The Open Source Modelica Consortium, created the 4th of December 2007 in Linköping, Sweden, in the following called OSMC, is a non-profit, non-governmental organization with the aim of developing and promoting the development and usage of the **OpenModelica open source implementation of the Modelica computer language** (also named Modelica modeling language) and **OpenModelica associated open-source tools and libraries**, collectively named the OpenModelica Environment, in the following referred to as OpenModelica.
- OpenModelica is **available for commercial and non-commercial usage under the conditions of the OSMC Public License**. It is the aim of OSMC, within the limitations of its available resources, to provide **support and maintenance of OpenModelica**, to support its publication on the web, and to **coordinate** contributions to OpenModelica.

Open Source Modelica Consortium

Originally Created Dec 4, 2007

7 Founding Organizational Members

- Bosch-Rexroth AG, Germany
- Equa Simulation AB, Sweden
- TLK Thermo, Germany
- VTT, Finland
- Linköping University, Sweden
- Hamburg University of Technology/TuTech, Institute of Thermo-Fluid Dynamics, Germany
- Technical University of Braunschweig, the Institut of Thermodynamik, Germany

OSMC – Open Source Modelica Consortium

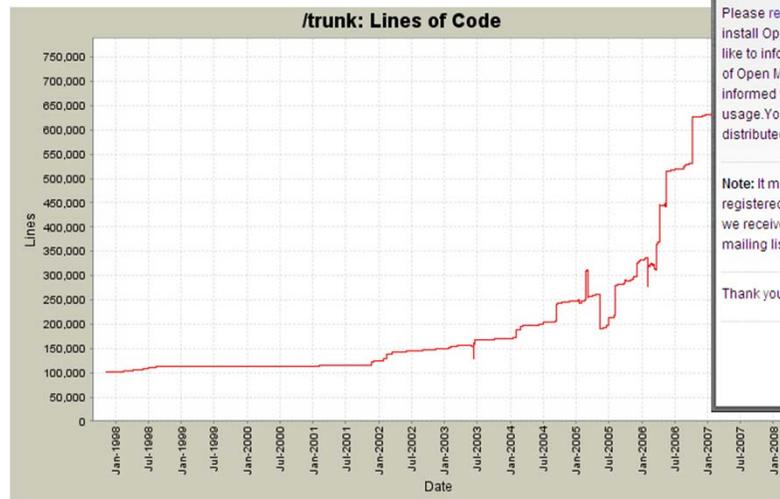
40 organizational members February 2012

Founded Dec 4, 2007

Open-source community services

- Website and Support Forum
- Version-controlled source base
- Bug database
- Development courses
- www.openmodelica.org

Code Statistics



The screenshot shows the OpenModelica website homepage. The browser address bar displays "http://www.openmodelica.org/". The page features a navigation menu with links for HOME, DEVELOPER, FORUM, DOWNLOAD, CONTACT US, WORKSHOP, and RESEARCH. A search bar is located on the right. The main content area includes a "Top information" section with a "New OpenModelica website is up" announcement, a "Registration" section with a call to action, and an "Introduction" section. A "Latest news" sidebar on the right lists recent releases and events, including "OpenModelica Release 1.5.0 RC2" and "OpenModelica Workshop 2010".

OSMC 40 Organizational Members, Feb 2012

(initially 7 members, 2007)

Companies and Institutes (22 members) Universities (18 members)

- ABB Corporate Research, Sweden
- Bosch Rexroth AG, Germany
- Siemens PLM, California, USA
- Siemens Turbo Machinery AB, Sweden
- CDAC Centre for Advanced Computing, Kerala, India
- Creative Connections, Prague, Czech Republic
- DHI, Aarhus, Denmark
- Evonik, Dehli, India
- Equa Simulation AB, Sweden
- Fraunhofer FIRST, Berlin, Germany
- Frontway AB, Sweden
- IFP, Paris, France
- InterCAX, Atlanta, USA
- ISID Dentsu, Tokyo, Japan
- MathCore Engineering/ Wolfram, Sweden
- Maplesoft, Canada
- TLK Thermo, Germany
- Sozhou Tongyuan Software and Control, China
- VI-grade, Italy
- VTI, Linköping, Sweden
- VTT, Finland
- XRG Simulation, Germany
- Linköping University, Sweden
- TU Berlin, Institute of UEBB, Germany
- FH Bielefeld, Bielefeld, Germany
- TU Braunschweig, Institute of Thermodynamics, Germany
- TU Dortmund, Proc. Dynamics, Germany
- Technical University Dresden, Germany
- Université Laval, modelEAU, Canada
- Georgia Institute of Technology, USA
- Ghent University, Belgium
- Griffith University, Australia
- Hamburg Univ. Technology/TuTech, Institute of Thermo-Fluid, Germany
- University of Ljubljana, Slovenia
- University of Maryland, Inst. Systems Engineering, USA
- University of Maryland, CEEE, USA
- Politecnico di Milano, Italy
- Ecoles des Mines, ParisTech, CEP, France
- Mälardalen University, Sweden
- Telemark University College, Norway

Open Source Modelica Consortium

Individual Members

(58 individual members, 6 February 2012)

- Peter Fritzson, Adrian Pop, Martin Sjölund, Per Östlund, Peter Aronsson, Adeel Asghar, Mikael Axin, Bernhard Bachmann, Vasile Baluta, Robert Braun, Willi Braun, David Broman, Stefan Brus, Francesco Casella, Filippo Donida, Jens Frenkel, Mahder Gebremedhin, Pavel Grozman, Daniel Hedberg, Michael Hanke, Zoheb Hossain, Alf Isaksson, Kim Jansson, Daniel Kanth, Tommi Karhela, Juha Kortelainen, Abhin Kothari, Petter Krus, Alexey Lebedev, Oliver Lenord, Ariel Liebman, Rickard Lindberg, Håkan Lundvall, Abhi Raj Metkar, Eric Meyers, Tuomas Miettinen, Afshin Moghadam, Maroun Nemer, Hannu Niemistö, Peter Nordin, Kristoffer Norling, Lennart Ochel, Karl Pettersson, Pavol Privitzer, Reino Ruusu, Per Sahlin, Wladimir Schamai, Gerhard Schmitz, Anton Sodja, Ingo Staack, Kristian Stavåker, Sonia Tariq, Mohsen Torabzadeh-Tari, Parham Vasaiely, Niklas Worschech, Robert Wotzlaw, Björn Zackrisson, Azam Zia

Open Source Modelica Consortium – OSMC

Board of Directors

- **Oliver Lenord**, OSMC Chairman; Manager, Siemens PLM, USA
- **Per Sahlin**, OSMC Vice Chairman; CEO, Equa Simulation AB
- **Peter Fritzson**, OSMC Director; Prof, Linköping University, Sweden
- **Juha Kortelainen**, Manager, VTT, Finland
- **Gerhard Schmitz**, Prof, Univ. Hamburg, Germany
- **Alf Isaksson**, Manager, ABB Corp. Research, Sweden
- **Francesco Casella**, Prof, Politecnico di Milano, Italy
- **Jan Brugård**, CEO, MathCore Engineering AB, Sweden
- **Kilian Link**, Manager, Siemens, Germany (and Sweden)
- **Lars Mikelsons**, Manager, Bosch-Rexroth, Germany (expected member from Feb 6, 2012).

OSMC Board – 5 Meetings Jan 1 2011 – Dec 31 2011

Meeting dates

- 110315
- 110518
- 110629
- 110920
- 111115

Board Work

- Planning and prioritizing the OSMC work
- Admitting new members
- Planning the workshop
- Budget
- etc.

OPENPROD –OpenModelica related Project

- Duration: June 2009 – Sept 2012 (3.3 years)
- Budget: approx 11 Meuro, 94 Manyears
- 28 partners
- Very important for OpenModelica development
- Successful review Sept 2011 after 2 years
- Final review fall 2012 including most application demos
- (New project MODRIO approved, starting fall 2012)

Main workpackages

- Integrated hardware software modeling by Modelica - UML - SysML integration.
- Model compiler enhancements.
- Compilation of Modelica to parallel multi-core platforms.
- Tool interoperability.
- Application demonstrators.

Some Swedish OpenModelica-Related Projects

- **HIPo** – High Speed Simulation for Product Design and Operation (2010 – 2013)
 - Model partitioning using TLM techniques
 - TLM-Partitioning for hi-speed on multi-core
- **EDOp** – Efficient Traceable Model-Based Dynamic Optimization (2011-2013)
 - Dynamic and parameter optimization
 - High-speed optimization on multi-core
- **RTSIM** – Real-Time Simulation (2011-2013)
 - India CDAC – Sweden PELAB Cooperation
 - Real-time code generation and control

Special Thanks

- The developers (Especially Adrian) who worked very hard during 2011. Adrian Pop, Martin Sjölund, Per Östlund, Jens Frenkel, Willi Braun, Lennart Ochel, Alexey Lebedev, and many others.
- The 38 OpenModelica consortium organizational members for support, especially Bosch-Rexroth, with OSMC Chairman Oliver Lenord (now at Siemens PLM); ABB, Siemens, etc...
- Master students and PhD students who made important contributions.

Conclusions and Summary 2011

- OSMC expanded from 32 to 38 organizational members.
- April 2011, OpenModelica 1.7 release. Improved OMC compiler. OMOptim subsystem.
- Nov 2011, OpenModelica 1.8 release. Flattening of Media library and part of Fluid. New Efficient Algorithmic Modelica debugger.
- Jan 2012. OpenModelica 1.8.1 Beta. Operator overloading. Factor 10 faster flattening for some models. ModelicaML
- 2012. Good prospects for the future – towards a standard high quality open source Modelica implementation in Modelica, increased tool support for integrated systems engineering.

Questions?

www.openmodelica.org