

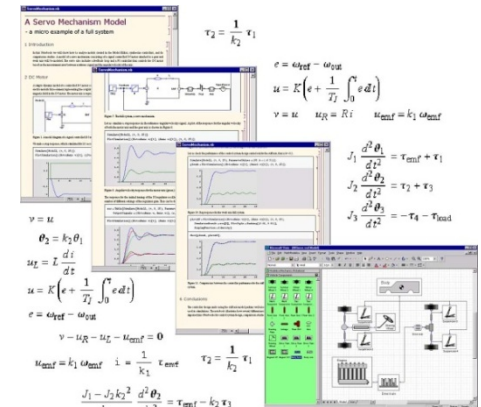
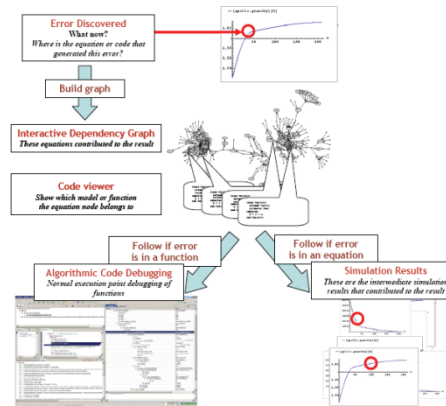
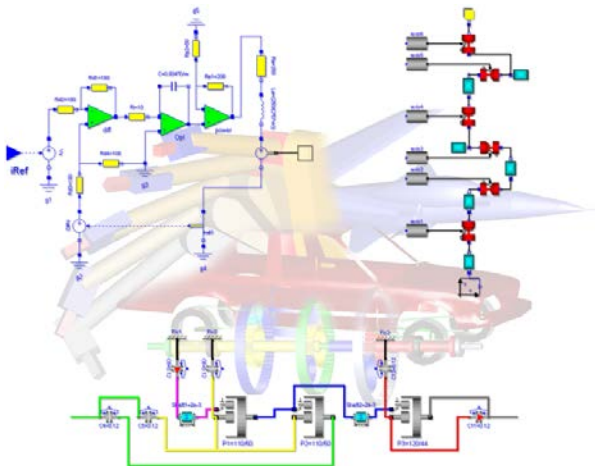
OpenModelica.org

Presentation, Status and Future Developments

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2018-02-05

Open Source Modelica Consortium
Programming Environment Laboratory
Department of Computer and Information Science
Linköping University



www.OpenModelica.org

- OpenModelica
 - What is OpenModelica?
 - The past
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook,
 - OMEdit, ModelicaML
- OpenModelica Development Environment
 - MetaModelica (RML/OMC)
 - The Eclipse Environment (MDT)
- OpenModelica Latest Developments (2017-2018)

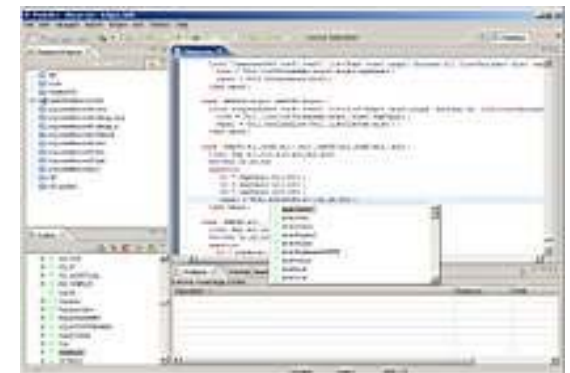
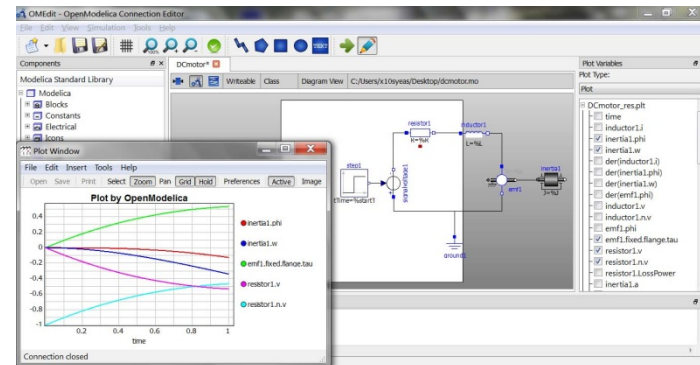
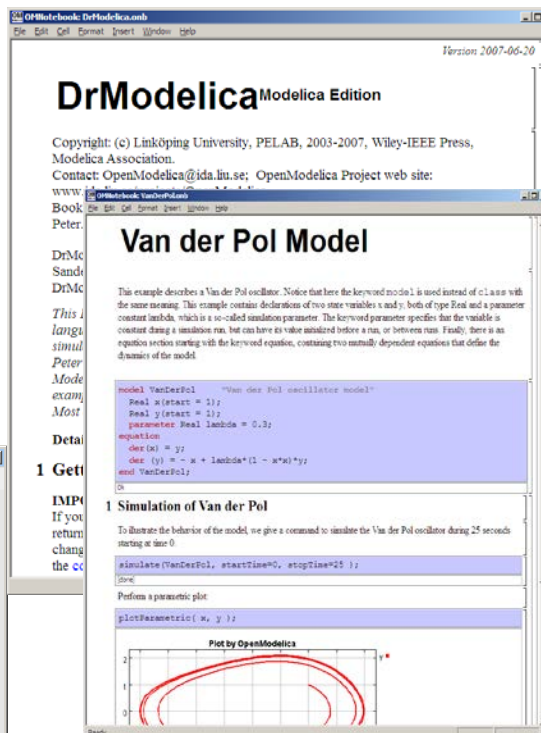
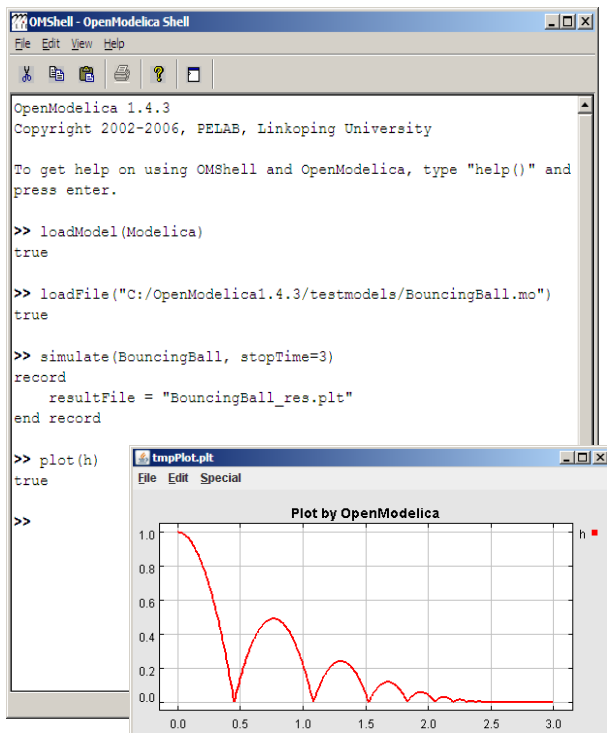
OpenModelica is ... its developers,
testers, bug reporters, contributors
and OSMC members

Thank you!

*asodja, sjoelund.se, sebco011, lochel, wbraun, niklwors, hubert.thieriot,
petar, perost, Frenkel TUD, Unknown, syeas460, adeas31, ppriv, ricli576,
haklu, dietmarw, levsu, mahge930, x05andfe, mohsen, nutaro, x02lucpo,
florosx, x06hener, x07simbj, stebr461, x08joekl, x08kimja, Dongliang Li,
jhare950, x97davka, krsta, edgarlopez, hanke, henjo, wuzhu.chen, fbergero,
harka011, tmtuomas, bjozac, AlexeyLebedev, x06klasj, ankar, kajny,
vasaie_p, niemisto, donida, hkiel, davbr, otto@mathcore.com, Kaie Kubjas,
x06krino, afshe, x06mikbl, leonardo.laguna, petfr, dhedberg, g-karbe,
x06henma, abhinnk, azazi, x02danhe, rruusu, x98petro, mater, g-bjoza,
x02kajny, g-pavgr, x05andre, vaden, jansilar, ericmeyers, x05simel, andsa,
leist, choeger, Ariel.Liebman, frisk, vaurich, mwalther, mtiller, ptauber,
casella, vitalij, hkiel, jank, rfranke, mflehmg, crupp2, kbalzereit,
marchartung, adrpo*

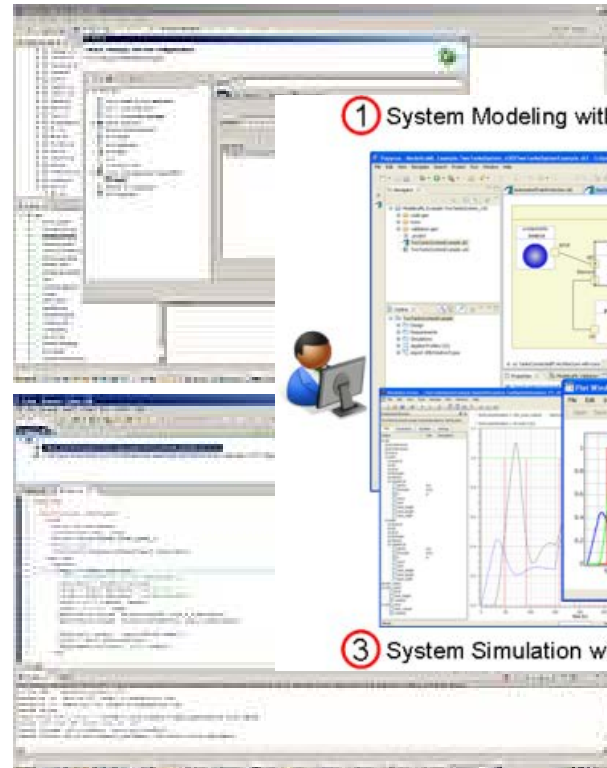
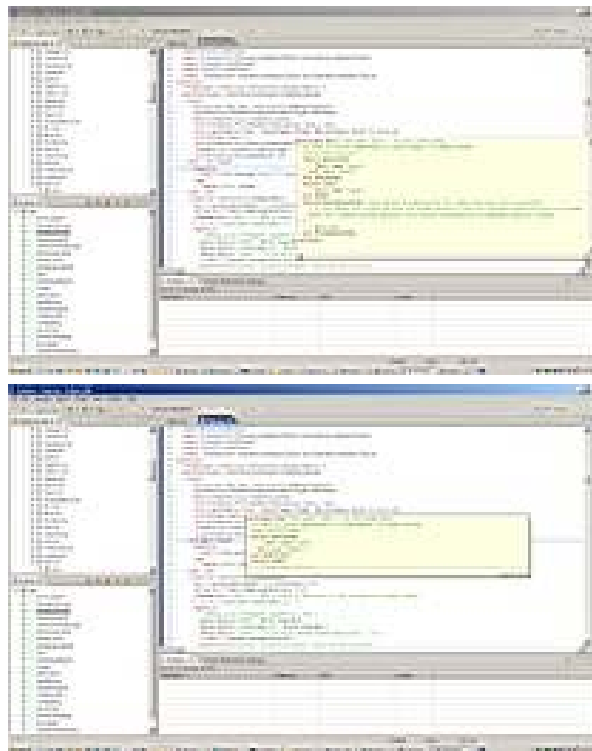
What is OpenModelica? (I)

- Advanced Interactive Modelica compiler (OMC)
 - Supports MSL v. 3.2.1/3.2.2/MSL trunk
- Basic and advanced environments for creating models
 - OMShell - an interactive command handler
 - OMNotebook - a literate programming notebook
 - OMEdit - Connection Editor, *Transformational and Algorithmic Debugger, 3D Viewer*
 - OMPlot - OpenModelica Plotting
 - OMOptim - OpenModelica Optimization Editor
 - OMPython - OpenModelica Python Environment
 - MDT - an advanced textual environment in Eclipse



What Is OpenModelica? (II)

- Advanced Eclipse-based Development Environment
- Modelica Development Tooling (MDT) - started in 2005
 - Code Assistance, Debugging, Outline & a lot more
 - *Used heavily for OpenModelica development*
 - Used in many OpenModelica Development Courses
 - *Slowly replaced by OMEdit*
- ModelicaML UML/SysML integration



① System Modeling with ModelicaML

② Modelica Code Generation

③ System Simulation with Modelica Tools

What is OpenModelica? (III)

- Open-source community services
 - Website and Support Forum
 - Source versioning (github.com)
 - Trac with bug database
 - Development courses
 - Mailing lists

Welcome to OpenModelica

<https://openmodelica.org>

OpenModelica

HOME DOWNLOAD TOOLS & APPS USERS DEVELOPERS FORUM EVENTS RESEARCH

Top information

OMEdit
Enhanced OpenModelica Connection Editor.

OMPYthon
The new OpenModelica Python Interface.

Modelica/OpenModelica Videos

Overview of Modelica, an C

Modelica Cyber Physical M

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.

Registration

Here is an overview presentation about Modelica and OpenModelica.

Donate

Please consider supporting our efforts.

Amount: SEK

Donate

Latest news

CFP OpenModelica Workshop February 2014

October 09: OpenModelica 1.9.0 released

September 27: OpenModelica 1.9.0 RC1 released

February 1: OpenModelica 1.9.0 Beta4 released

October 19: OpenModelica 1.9.0 Beta2 released

Oct 16 : CFP OpenModelica/MODPROD Workshops February 2013

August 31: OpenModelica 1.9.0 Beta released

April 4: OpenModelica 1.8.1 released

OpenModelica

Linköping, Sweden <https://openmodelica.org> openmodelica@ida.liu.se

Repositories People 21 Teams 6 Settings

Filters Find a repository... + New repository

OpenModelica

OpenModelica is an open-source Modelica-based modeling and simulation environment intended for industrial and academic usage.

Updated an hour ago

OMCompiler

The OpenModelica Compiler is the core of the OpenModelica project, which is an open-source Modelica-based modeling and simulation environment intended for industrial and academic usage.

Updated an hour ago

OMLibraries

Updated 14 hours ago

People 21

Invite someone

OpenModelica

<https://trac.openmodelica.org/OpenModelica/wiki>

OpenModelica Project

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).

This Trac installation is intended to help with the OpenModelica Project management, development, bug fixing, etc.

Documentation

Automatically generated documentation of OpenModelica and Modelica.

Writing efficient MetaModelica code

Details on how to write efficient MetaModelica code for the bootstrapped compiler is here.

Modelica Compliant Libraries

We have made a list with compatibility issues between tools. To write compliant library follow this document.

Contribute

You can report a bug by adding a new ticket. Please have a look at all the open tickets first.

Testing

We run builds and tests using Hudson. Check the latest build and test status.

Check the status of the (in development) compliance suite of the Modelica specification.

Check the latest MSL 3.2.1 coverage.

Check the latest ModelicaTest 3.2.1 coverage.

Check the historical MSL coverage or trend of all tested libraries.

Check the directory of all tested libraries.

MSL 3.2.1 Coverage

ModelicaTest 3.2.1 Coverage

Legend

Target: 274
Complete: 265
Simulate: 245

Legend

Target: 431
Complete: 414
Simulate: 395

- Open-source community services

-
- The screenshot displays the OpenModelica.org website, which serves as a central hub for the project's development and testing. The top navigation bar includes links to the project's GitHub repository, documentation, and other resources. The main content area is divided into several sections:
- Hudson:** A section showing the status of the Continuous Integration (CI) system. It includes a "Jobs Status" table with columns for job name, last success, last failure, and last duration. The table lists various jobs, including "Annex60_Compilation", "Annex60_Coverage", "Annex60_Flatten", "Annex60_Simulation", "Annex60_Verification", "BioChem_Compilation", "BioChem_Coverage", "BioChem_Simulation", "BioChem_Verification", "ThermoSuiPro_Coverage", "ThermoSuiPro_Simulation", "ThermoSuiPro_Verification", "SystemDynamics_Coverage", "SystemDynamics_Simulation", "SystemDynamics_Verification", "SiemensPower_Coverage", "SiemensPower_Simulation", "SiemensPower_Verification", "PowerSystems_Coverage", "PowerSystems_Simulation", "PowerSystems_Verification", "OpenHydraulics_Coverage", "OpenHydraulics_Simulation", "OpenHydraulics_Verification", "ModelicaTest_3.2.1_Coverage", "MSL_trunk_Coverage", and "MSL_3.2.1_Coverage".
 - Statistics:** A section providing an overview of the project's statistics, including the number of libraries (61) and models (10953).
 - Tested branches:** A table showing the results of tests for various branches. The table includes columns for branch name, version, build time, execution time, and the number of simulations and total tests. The branches listed include v1.8.1-rc1, v1.9.0-rc1, v1.9.1, v1.9.2, v1.9.3, v1.9.4, v1.9.5, v1.9.6, v1.9.7, v1.9.8, v1.9.9, v1.10.0, v1.10.1, v1.10.2, v1.10.3, v1.10.4, v1.10.5, v1.10.6, v1.10.7, v1.10.8, v1.10.9, v1.10.10, v1.10.11, v1.10.12, v1.10.13, v1.10.14, v1.10.15, v1.10.16, v1.10.17, v1.10.18, v1.10.19, v1.10.20, v1.10.21, v1.10.22, v1.10.23, v1.10.24, v1.10.25, v1.10.26, v1.10.27, v1.10.28, v1.10.29, v1.10.30, v1.10.31, v1.10.32, v1.10.33, v1.10.34, v1.10.35, v1.10.36, v1.10.37, v1.10.38, v1.10.39, v1.10.40, v1.10.41, v1.10.42, v1.10.43, v1.10.44, v1.10.45, v1.10.46, v1.10.47, v1.10.48, v1.10.49, v1.10.50, v1.10.51, v1.10.52, v1.10.53, v1.10.54, v1.10.55, v1.10.56, v1.10.57, v1.10.58, v1.10.59, v1.10.60, v1.10.61, v1.10.62, v1.10.63, v1.10.64, v1.10.65, v1.10.66, v1.10.67, v1.10.68, v1.10.69, v1.10.70, v1.10.71, v1.10.72, v1.10.73, v1.10.74, v1.10.75, v1.10.76, v1.10.77, v1.10.78, v1.10.79, v1.10.80, v1.10.81, v1.10.82, v1.10.83, v1.10.84, v1.10.85, v1.10.86, v1.10.87, v1.10.88, v1.10.89, v1.10.90, v1.10.91, v1.10.92, v1.10.93, v1.10.94, v1.10.95, v1.10.96, v1.10.97, v1.10.98, v1.10.99, v1.10.100, v1.10.101, v1.10.102, v1.10.103, v1.10.104, v1.10.105, v1.10.106, v1.10.107, v1.10.108, v1.10.109, v1.10.110, v1.10.111, v1.10.112, v1.10.113, v1.10.114, v1.10.115, v1.10.116, v1.10.117, v1.10.118, v1.10.119, v1.10.120, v1.10.121, v1.10.122, v1.10.123, v1.10.124, v1.10.125, v1.10.126, v1.10.127, v1.10.128, v1.10.129, v1.10.130, v1.10.131, v1.10.132, v1.10.133, v1.10.134, v1.10.135, v1.10.136, v1.10.137, v1.10.138, v1.10.139, v1.10.140, v1.10.141, v1.10.142, v1.10.143, v1.10.144, v1.10.145, v1.10.146, v1.10.147, v1.10.148, v1.10.149, v1.10.150, v1.10.151, v1.10.152, v1.10.153, v1.10.154, v1.10.155, v1.10.156, v1.10.157, v1.10.158, v1.10.159, v1.10.160, v1.10.161, v1.10.162, v1.10.163, v1.10.164, v1.10.165, v1.10.166, v1.10.167, v1.10.168, v1.10.169, v1.10.170, v1.10.171, v1.10.172, v1.10.173, v1.10.174, v1.10.175, v1.10.176, v1.10.177, v1.10.178, v1.10.179, v1.10.180, v1.10.181, v1.10.182, v1.10.183, v1.10.184, v1.10.185, v1.10.186, v1.10.187, v1.10.188, v1.10.189, v1.10.190, v1.10.191, v1.10.192, v1.10.193, v1.10.194, v1.10.195, v1.10.196, v1.10.197, v1.10.198, v1.10.199, v1.10.200, v1.10.201, v1.10.202, v1.10.203, v1.10.204, v1.10.205, v1.10.206, v1.10.207, v1.10.208, v1.10.209, v1.10.210, v1.10.211, v1.10.212, v1.10.213, v1.10.214, v1.10.215, v1.10.216, v1.10.217, v1.10.218, v1.10.219, v1.10.220, v1.10.221, v1.10.222, v1.10.223, v1.10.224, v1.10.225, v1.10.226, v1.10.227, v1.10.228, v1.10.229, v1.10.230, v1.10.231, v1.10.232, v1.10.233, v1.10.234, v1.10.235, v1.10.236, v1.10.237, v1.10.238, v1.10.239, v1.10.240, v1.10.241, v1.10.242, v1.10.243, v1.10.244, v1.10.245, v1.10.246, v1.10.247, v1.10.248, v1.10.249, v1.10.250, v1.10.251, v1.10.252, v1.10.253, v1.10.254, v1.10.255, v1.10.256, v1.10.257, v1.10.258, v1.10.259, v1.10.260, v1.10.261, v1.10.262, v1.10.263, v1.10.264, v1.10.265, v1.10.266, v1.10.267, v1.10.268, v1.10.269, v1.10.270, v1.10.271, v1.10.272, v1.10.273, v1.10.274, v1.10.275, v1.10.276, v1.10.277, v1.10.278, v1.10.279, v1.10.280, v1.10.281, v1.10.282, v1.10.283, v1.10.284, v1.10.285, v1.10.286, v1.10.287, v1.10.288, v1.10.289, v1.10.290, v1.10.291, v1.10.292, v1.10.293, v1.10.294, v1.10.295, v1.10.296, v1.10.297, v1.10.298, v1.10.299, v1.10.300, v1.10.301, v1.10.302, v1.10.303, v1.10.304, v1.10.305, v1.10.306, v1.10.307, v1.10.308, v1.10.309, v1.10.310, v1.10.311, v1.10.312, v1.10.313, v1.10.314, v1.10.315, v1.10.316, v1.10.317, v1.10.318, v1.10.319, v1.10.320, v1.10.321, v1.10.322, v1.10.323, v1.10.324, v1.10.325, v1.10.326, v1.10.327, v1.10.328, v1.10.329, v1.10.330, v1.10.331, v1.10.332, v1.10.333, v1.10.334, v1.10.335, v1.10.336, v1.10.337, v1.10.338, v1.10.339, v1.10.340, v1.10.341, v1.10.342, v1.10.343, v1.10.344, v1.10.345, v1.10.346, v1.10.347, v1.10.348, v1.10.349, v1.10.350, v1.10.351, v1.10.352, v1.10.353, v1.10.354, v1.10.355, v1.10.356, v1.10.357, v1.10.358, v1.10.359, v1.10.360, v1.10.361, v1.10.362, v1.10.363, v1.10.364

What is OpenModelica? (V)

- **An incubator platform for research**
 - 9 PhDs since 2004 (Debugging, Parallelization, PDEs Extensions)
 - 36 Master's theses since 2004
 - Both the students and the project benefit
- **Master theses at PELAB 2006-2018**
 - Refactoring/Parsing and Language extensions
 - UML/SysML view of Modelica code
 - 2D and 3D visualization tools
 - Static and runtime debugging tools
 - Advanced code generation and parallelization of simulation code
 - Bootstrapping and Java Interface
 - Function pointers
 - NVIDIA for Cuda and OpenCL parallel simulation
 - OMEdit - Modelica Connection Editor
 - OMWeb - server based Modelica simulation for teaching
 - OMCcc parser
 - PDE-solver using ParModelica
- **External Master theses**
 - Model based diagnostics at ISY (Dep. Of Electrical Engineering)
 - Monte-Carlo simulation of Satellite Separation Systems at SAAB
 - Interactive Simulations (EADS)
 - Additional Solvers + Event handling (FH-Bielefeld)
 - EADS - ModelicaML
- **A Base for commercial and open source products**
 - MathCore AB, Bosch Rexroth, VTT, Equa, Evonik, ABB

OpenModelica Roadmap - Past

1997 - started as a master thesis

2003 - first usable internal version

2004 - first external version: OpenModelica 1.1

2005 - more development: OpenModelica 1.3.1

2006 - major milestone

- Translated the whole compiler to MetaModelica
- Integrated Development Environment for the compiler
- OpenModelica website started
- Moved the code repository to Subversion management
- Extended the OpenModelica environment with new tools
- 4 versions released during the year
- External people start using OpenModelica
 - ~ 200 downloads/month
 - first development course at INRIA

OpenModelica Roadmap - Past

2007 - continued development and community involvement

- Improvement in website, support and documentation
- Answered ~1000 questions on the forum
- Portability is highly improved, ported to 4 platforms
 - Linux, Mac, Solaris, Windows (version 1.4.3)
- Improvement of the compiler development tools in Eclipse
- OpenModelica Community starts to react
 - contribute code & report bugs & request enhancements & participate in answering questions in the OpenModelica forum
 - participate at courses and workshops
- New server acquired for better community services
- Increased usage: ~600 downloads/month
- Open Modelica Consortium created in December 4
 - 4 months of work
 - 9 organizations as members already (3 Universities, 6 Companies)
 - discussions are ongoing with other 6 companies

2008 - Further work on the compiler

- Release 1.4.4 and 1.4.5
 - Linux, Mac, Solaris, Windows
- New Solver Interface
- Refactoring
- Dynamic loading of functions
- Merging of MathCore front-end code
- 744 commits in Subversion
- Other things I don't remember

OpenModelica Roadmap – Past

2009

- Work mainly happened in OSMC (partially on a non-public branch)
- **Front-end**
 - Refactoring (OSMC)
 - Enumerations (OSMC)
 - Java Interface and Bootstrapping (Martin Sjölund)
 - MultiBody flattening (OSMC)
 - Constraint connection graph breaking (VTT + OSMC)
 - Support for Modelica 3.x and 3.x annotations (OSMC)
- **Back-end**
 - Tearing in the back-end (Jens Frenkel)
 - Template Code Generation and CSharp backend (Pavol Privitzer, Charles University Prague)
 - Interactive Simulations (EADS)
 - C++ Code generation (Bosch Rexroth)
 - Java Interface and Bootstrapping (Martin Sjölund)
 - Additional Solvers + Events (Willi Braun, FH-Bielefeld)
- **General**
 - New ModelicaML + SysML prototype (EADS)
 - 1144 commits in subversion (Since 2009 to February 8, 2010)
 - Bug fixes (OSMC)
 - Release 1.5.0 and 1.5.0-RC_X (Linux, Mac, Solaris, Windows)
- **More things I don't remember**

OpenModelica Roadmap – Past

2010 – 2011

- Support for Modelica Standard Library 3.1 (Media & Fluid in works)
- **Front-end**
 - MultiBody flattening (OSMC)
 - Support for Modelica 3.x and 3.x annotations (OSMC)
 - Performance Enhancements
 - Stream connectors
 - Media & Fluid work is on the way
- **Back-end**
 - Back-end redesign (Jens, Willi, Martin, Per, Adrian, Kristian, Filippo)
 - Tearing in the back-end (Jens Frenkel)
 - Template Code Generation and CSharp backend (Pavol Privitzer, Charles University Prague)
 - Interactive Simulations (EADS)
 - C++ Code generation (Bosch Rexroth)
 - Additional Solvers + Events + Linearization (Willi Braun, FH-Bielefeld)
- **General**
 - OMEdit – new connection editor
 - Bootstrapping OMC (90% finished)
 - 2550 commits in subversion from 2010 to Feb. 7, 2011 (double than 2009-2010)
 - Bug fixes ~300+ (OSMC)
 - Release 1.6.0 (Linux, Mac, Windows)
 - Downloads Windows (~16434) , Linux (~8301), Mac (~2816)
- **More things I don't remember**

OpenModelica Roadmap – Past

2012 – 2013

- Support for Modelica Standard Library 3.2.1 including Media & Fluid
- **Front-end**
 - Performance Enhancements
 - Media & Fluid work
 - Operator overloading
 - New instantiation module started
- **Back-end**
 - Modular back-end with more optimization modules (Jens, Willi, Martin)
 - New simulation runtime redesign (Willi, Lennart, Jens, Martin, Adrian)
 - C++ Code generation (Bosch Rexroth)
 - FMI export & import
 - Initialization, Jacobians (Lennart Lochel, Willi Braun, FH-Bielefeld)
 - Support for parallelization (Martin)
 - Parallel extensions in functions
- **General**
 - Uncertainties support (OpenTURNS connection & Data reconciliation)
 - MDT GDB debugging based on GDB and the bootstrapped compiler
 - OMEdit – improvements
 - Bootstrapping OMC (100% finished) using Boehm GC
 - 3909 commits in subversion from 2012 to Feb. 4, 2013
 - 2000 forum posts (questions and answers)
 - Bug fixes ~247+ (OSMC)
 - Release 1.9.0 (Linux, Mac, Windows)
 - Downloads Windows (~45307) , Linux (~15543), Mac (~5367)
- **More things I don't remember**

OpenModelica Roadmap – Past

- 2014 – 2016 – Most focus on libraries support & performance
 - MSL 3.2.1 (100% build/98% simulate), ModelicaTest 3.2.1, PetriNet, Buildings, PowerSystems, OpenHydraulics, ThermoPower, and ThermoSysPro
 - Switch to bootstrapped compiler
- Front-end, Back-end, Simulation Runtime, Graphical Clients
 - Development switched to bootstrapped compiler since November 2014
 - Partially new graph-based front-end with better support for libraries
 - Improved back-end: initialization, system solving, parallelization, cse optimization, dynamic optimization
 - Faster and much more user friendly OpenModelica Connection editor
- General
 - ~9000 commits in subversion from Feb. 2014 to Feb., 2016
 - Bug fixes
 - Release 1.9.2 (Linux, Mac, Windows)

- New testing procedure developed by Martin Sjölund
 - <https://libraries.openmodelica.org/branches/overview-combined.html>
 - Run tests on previous OpenModelica version until 1.8.1
 - Detect both model regression and performance regression, all information saved in a database
 - 61 libraries, 10954 models with interactive result comparison.
 - 2 dedicated test servers
 - Linux (GCC & CLANG), Windows (MinGW GCC), Mac OS (GCC)
 - Platforms: x86, x86_64, ARM
 - 3 runtimes: FMI, C runtime, C++ runtime

Statistics

Number of libraries 61

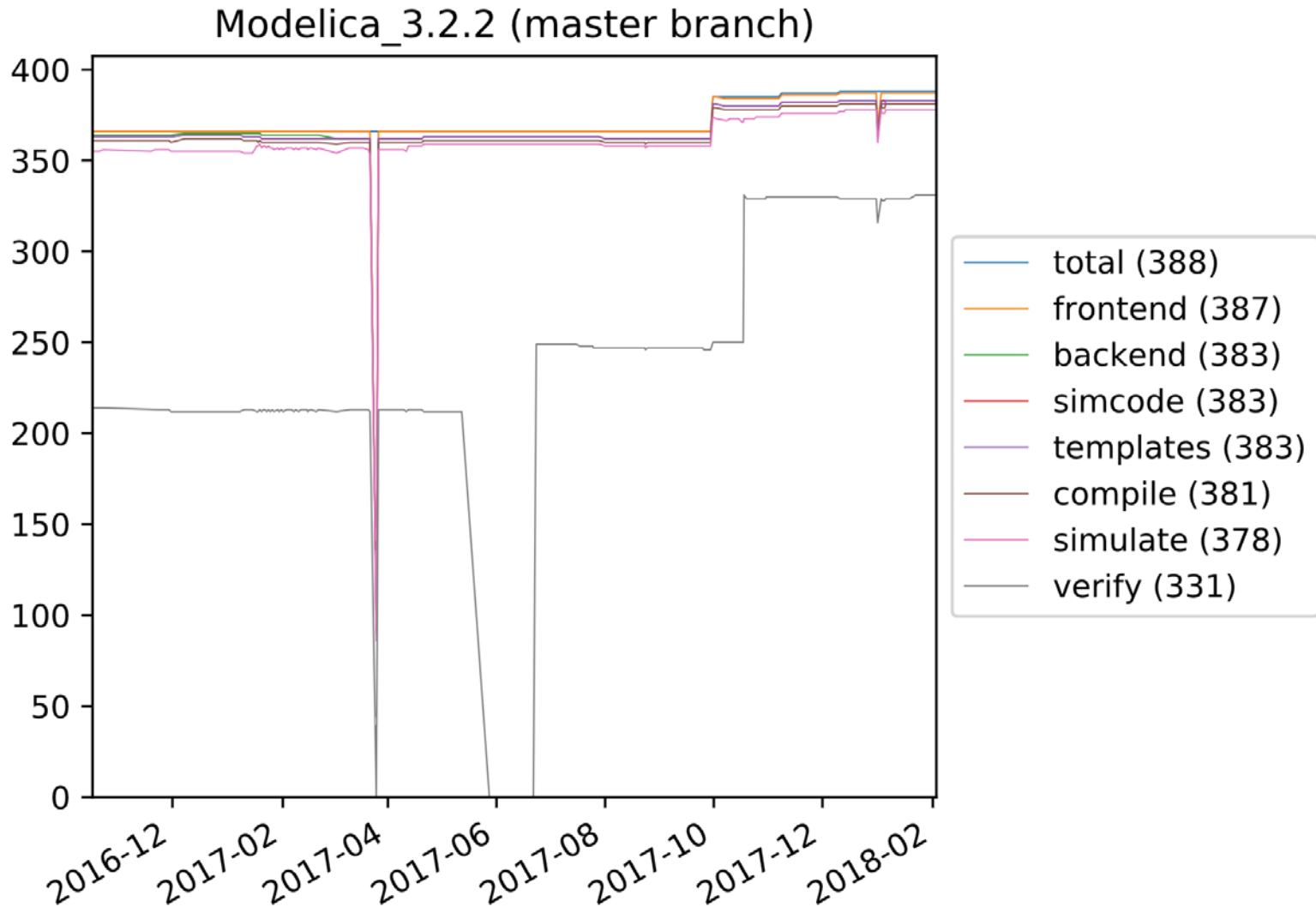
Number of models 10953

Tested branches

Branch	Version	Build time	Execution time	# Simulate	# Total
v1.8.1-rml	1.8.1 (r11645+2)	2018-02-03 06:07:37	1 day, 15:42:22	1232	10951
v1.9.0-rml	1.9.0 (r17627)	2018-02-03 11:12:55	1 day, 20:29:54	3746	10951
v1.9.1	1.9.1 (r22929) (Bootstrapping version)	2018-02-03 16:53:40	2 days, 2:30:04	4492	10951
v1.9.2	1.9.2 (r25115 C++)	2018-02-03 23:19:29	1 day, 18:16:36	5390	10953
v1.9.3	OpenModelica 1.9.3	2018-02-04 04:40:01	1 day, 21:05:48	5853	10953
v1.9	v1.9.7-v1.9.7.3+g6347e1f61	2018-02-04 10:23:18	1 day, 11:52:05	6310	10953
v1.11	v1.11.0-v1.11.0.8+gbda991e5b	2018-02-04 14:58:28	1 day, 8:27:16	6375	10953
v1.12	OMCompiler v1.12.0-v1.12.0.5+g7df4d9186	2018-02-04 15:34:22	1 day, 18:59:49	9053	10953
master	OMCompiler v1.13.0-dev.397+g17ce08db2	2018-02-04 16:26:47	1 day, 17:20:40	9090	10953

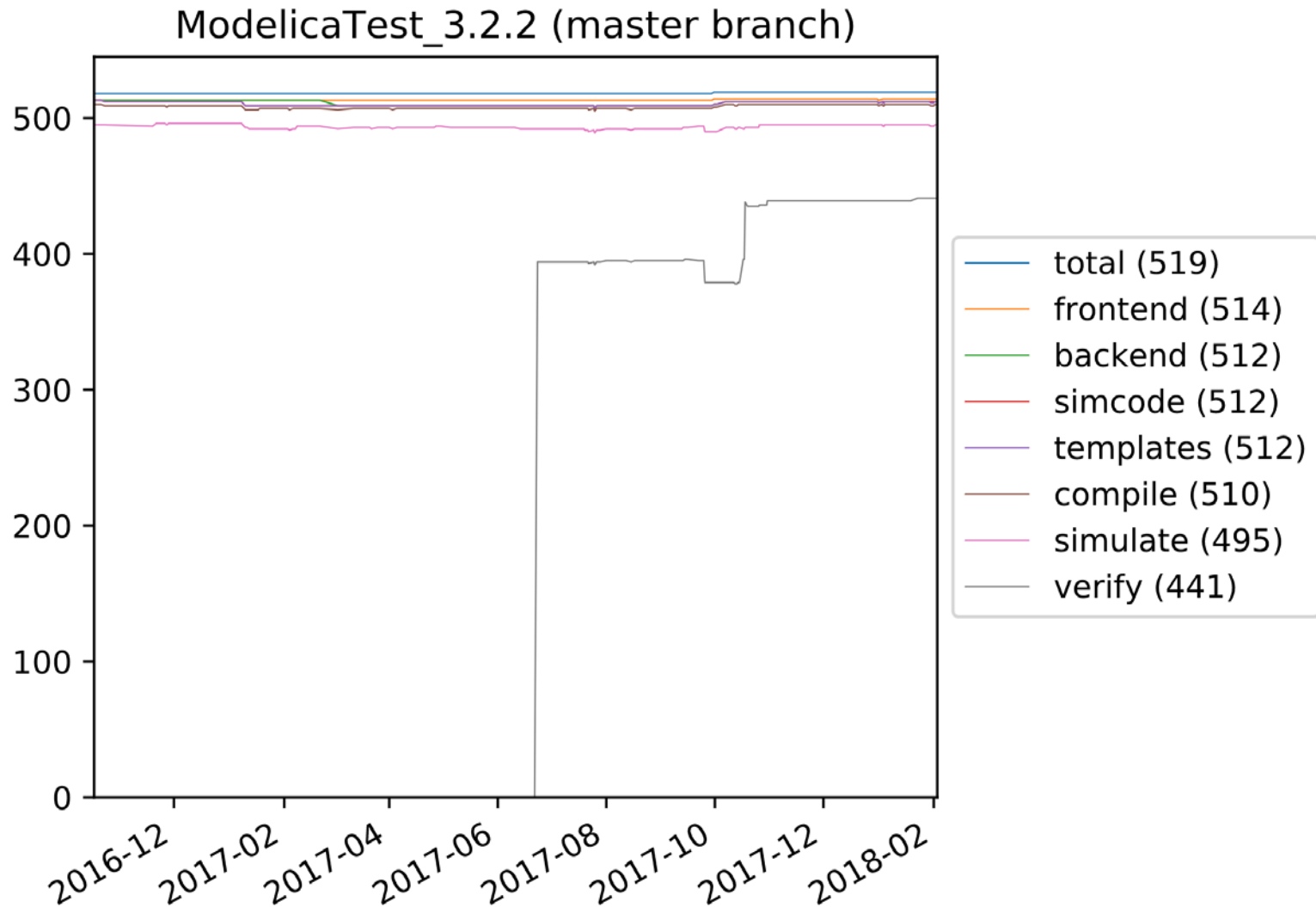
OpenModelica Testing (II)

- 2018-02-05 v1.13-dev - total 388 - build 381 (99%) - sim 378 (98%)



OpenModelica Testing (III)

- 2018-02-05 v1.13-dev - total 519 - build 510 (97%) - sim 495 (96%)



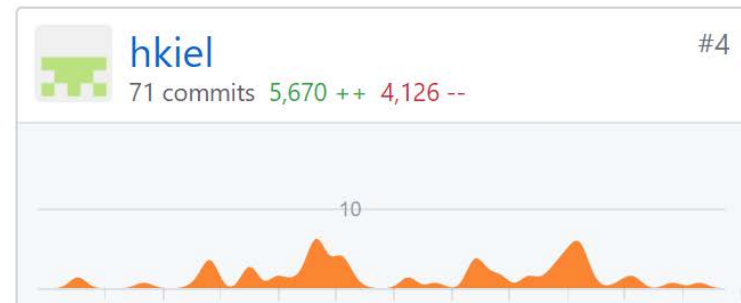
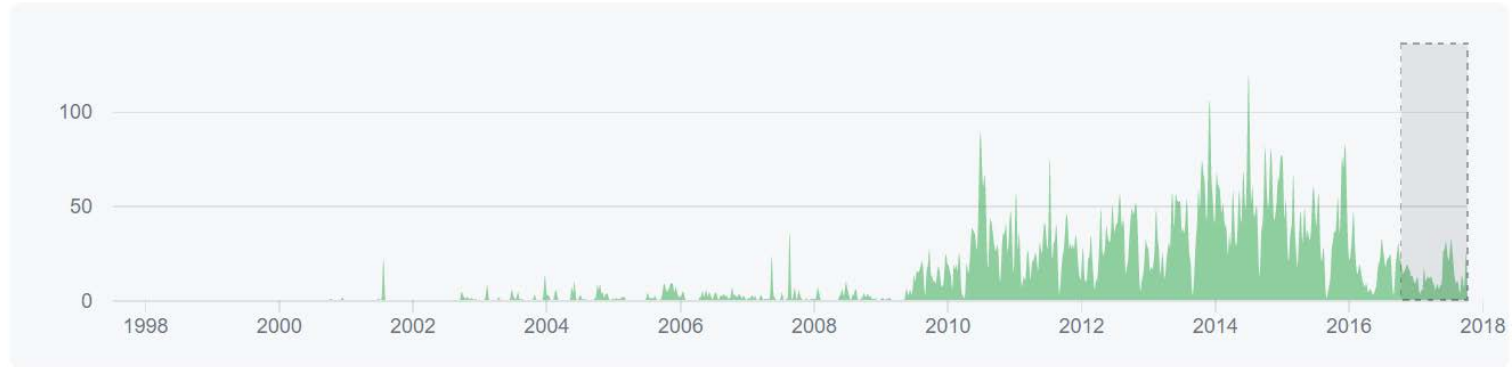
- Moved the source code to github May 2015
 - Mature code base: <https://github.com/OpenModelica>
 - ~9000K lines of code and tests
-
- From Feb 2016 - Feb 2017
 - 60 contributors
 - 1420 commits (OMCompiler)
-
- From Feb 2017 - Feb 2018
 - 20 contributors
 - 794 commits (OMCompiler)

OpenModelica Statistics (II)

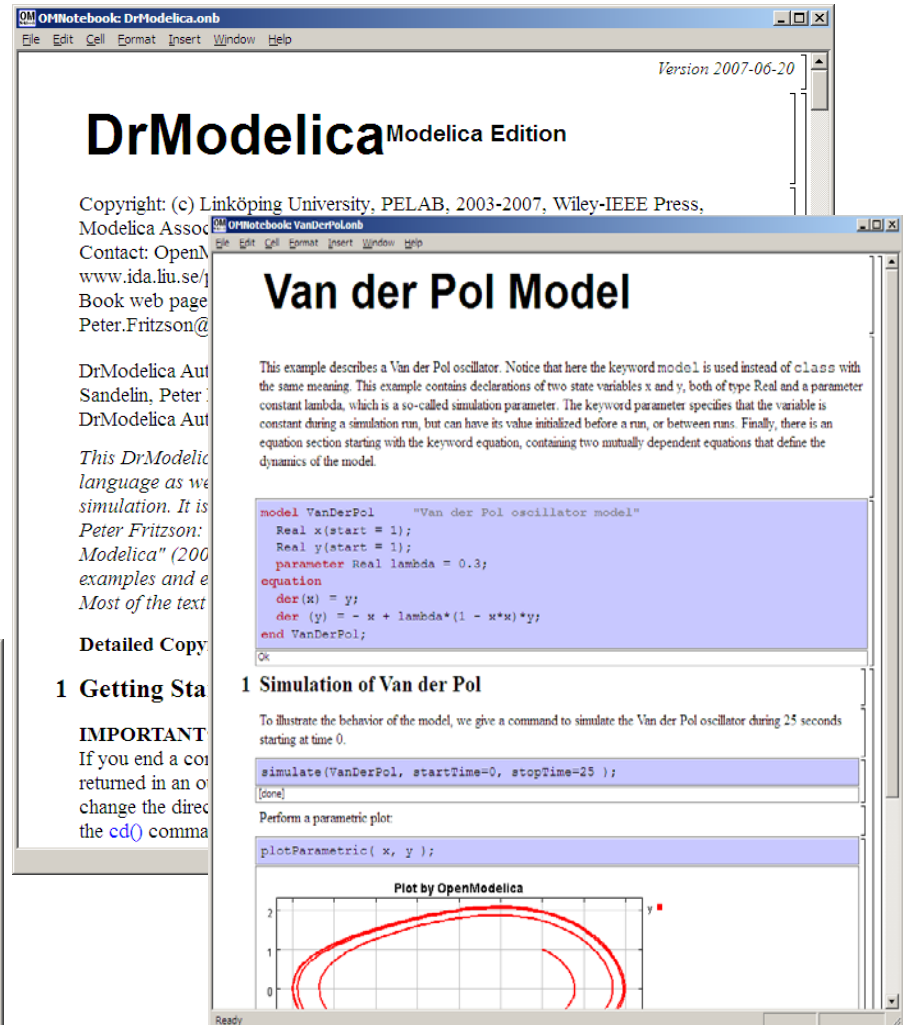
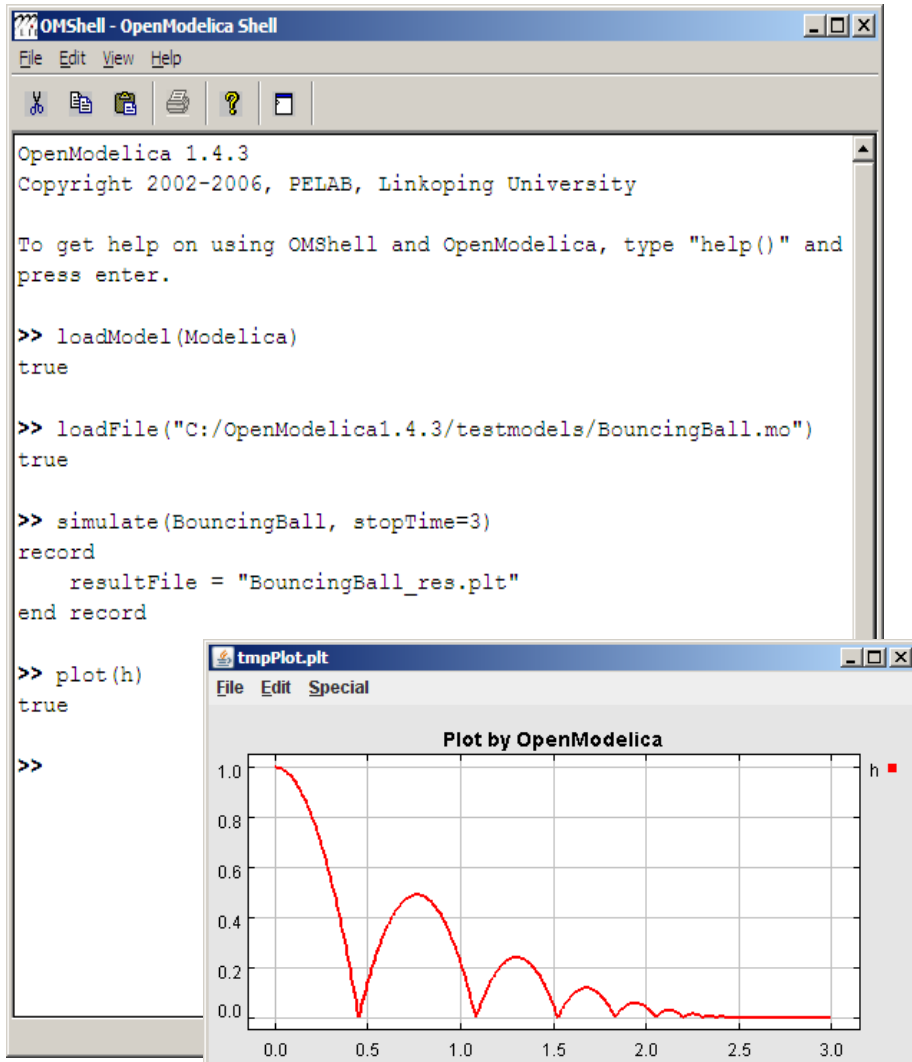
Feb 5, 2017 – Feb 4, 2018

Contributions: Commits ▾

Contributions to master, excluding merge commits



- OpenModelica
 - What is OpenModelica?
 - The past
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook,
 - OMEdit, ModelicaML
- OpenModelica Development Environment
 - MetaModelica (RML/OMC)
 - The Eclipse Environment
- OpenModelica Latest Developments (2017-2018)



OMEdit- OpenModelica Connection Editor

OMEdit - OpenModelica Connection Editor

File Edit View Simulation FMI Export Tools Help

Libraries Browser

Search Classes

Libraries

- OpenModelica
- ModelicaReference
- ModelicaServices
- Complex
- Modelica
 - UsersGuide
 - Blocks
 - ComplexBlocks
 - StateGraph
 - Electrical
 - Magnetic
 - Mechanics
 - MultiBody
 - UsersGuide
 - World
 - Examples
 - Elementary
 - DoublePendulum

Modelica.Mechanics.MultiBody.Examples.Elementary.DoublePendulum

Writable Model Diagram View F:/OpenModeli...lePendulum.mo Line: 1, Col: 0

X: -49.98 Y: 70.64

Welcome Modeling Plotting

- Implemented mainly in MetaModelica (401 packages) and a C/C++ runtime
- Is (now) available as a dynamic library (faster than CORBA)
- Used from OMEdit, OMNotebook, OMShell, OMOptim, OMPython, MDT
- Automatically generated API that can be used from QT

Modelica->AST->SCode->DAE->C Code

// Parse the file and get an AST back

```
ast = Parse.parse(modelicaFile);
```

// Translate to simplified C code

```
scode = SCode.absyn2SCode(ast);
```

// flatten the simplified code

```
(cache, dae1) = Inst.instantiate(Env.emptyCache, scode);
```

// Call the function that optimizes the DAE

```
optimizeDae(scode, ast, dae, dae, lastClassName);
```

- OpenModelica
 - What is OpenModelica?
 - The past and present
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook
 - OMEdit, ModelicaML
- OpenModelica Development Environment
 - MetaModelica
 - The Eclipse Environment
- OpenModelica Latest Developments (2017-2018)

- OMC
 - Implemented mainly in MetaModelica and C/C++
- Modelica
 - classes, models, records, functions, packages
 - behavior is defined by equations or/and functions
 - equations
 - differential algebraic equations and conditional equations
- MetaModelica extensions
 - local equations
 - pattern equations
 - match expressions
 - high-level data structures: lists, tuples, option and uniontypes

MDT - Creating Modelica projects (I)

The screenshot illustrates the process of creating a Modelica project in the Eclipse SDK. The main window shows the 'File' menu with 'New' > 'Project...' selected. A red arrow points from this menu item to the 'New Project' dialog. In this dialog, the 'Wizards' list on the left has 'Modelica Project' selected, also indicated by a red arrow. A second red arrow points from the 'Next >' button at the bottom of the 'New Project' dialog to the 'Next >' button in the 'New Modelica Project' wizard. The 'New Modelica Project' dialog shows the project name 'demo' and has 'Next >' and 'Finish' buttons visible.

Modelica - Eclipse SDK

File Edit Refactor Navigate Search Project Run Window Help

New Alt+Shift+N Project...
Open File...
Close Ctrl+F4
Close All Ctrl+Shift+F4
Save Ctrl+S
Save As...
Save All Ctrl+Shift+S
Revert
Move...
Rename... F2
Refresh F5
Convert Line Delimiters To
Print... Ctrl+P
Switch Workspace...
Import

New Project
Select a wizard
Create a new Modelica project.

Wizards:

- Plug-in Project
- C
- C++
- CVS
- Eclipse Modeling Framework
- EJB
- Functional Programming
- J2EE
- Java
- Modelica
- Modelica Project**
- Plug-in Development
- Simple
- Web
- Examples

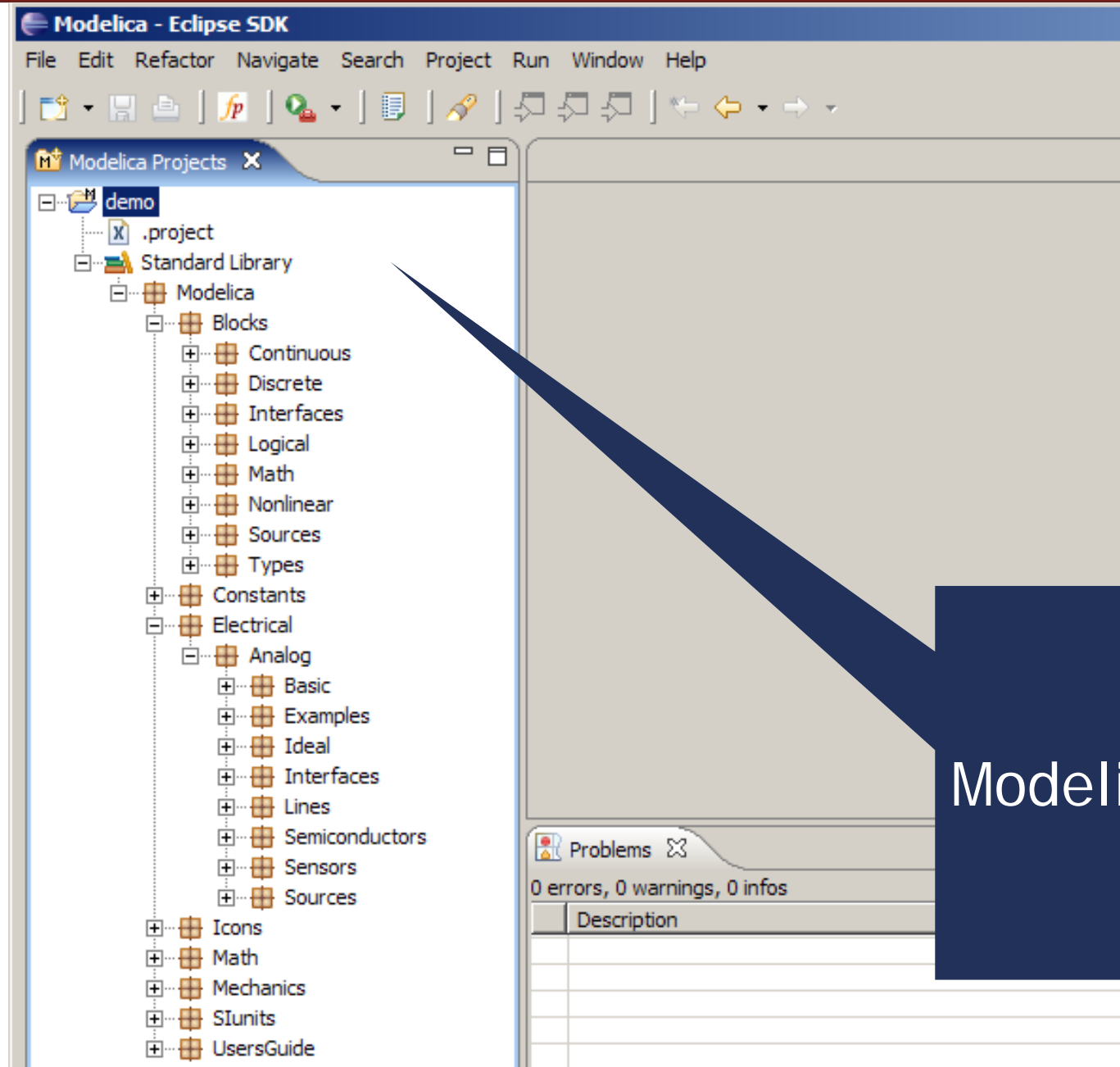
New Modelica Project
Create a Modelica project
Create a Modelica project in the workspace.

Project name: demo

< Back Next > Finish Cancel

Creation of Modelica projects using wizards

Creating Modelica projects (II)



Modelica project

Creating Modelica packages

The screenshot shows the Modelica - Eclipse SDK interface. The 'New' menu is open, and the 'Modelica Package' option is selected. The 'New Modelica Package' wizard is displayed, showing the following fields:

- Source folder: demo
- Package: (empty)
- Name: MyPackage
- Description: A Modelica Package
- ☐ is encapsulated package

The 'Finish' button is highlighted with a red arrow. A blue callout box on the left contains the text 'Creation of Modelica packages using wizards'.

Creating Modelica classes

Modelica - Eclipse SDK

File Edit Refactor Navigate Search Project Run Window Help

Modelica Projects

- New
 - Project...
 - Modelica Package
 - Modelica Class**
 - Folder
 - File
 - External Project...
- Delete
- Build Project
- Refresh
- Open Project
- Close Project
- Go Home
- Go Back
- Go Into
- Team

New Modelica Class

Modelica Class

Create a new Modelica class.

Source folder: demo/MyPackage Browse...

Package: MyPackage Browse...

Name: MyClass

Restriction: model

Modifiers:

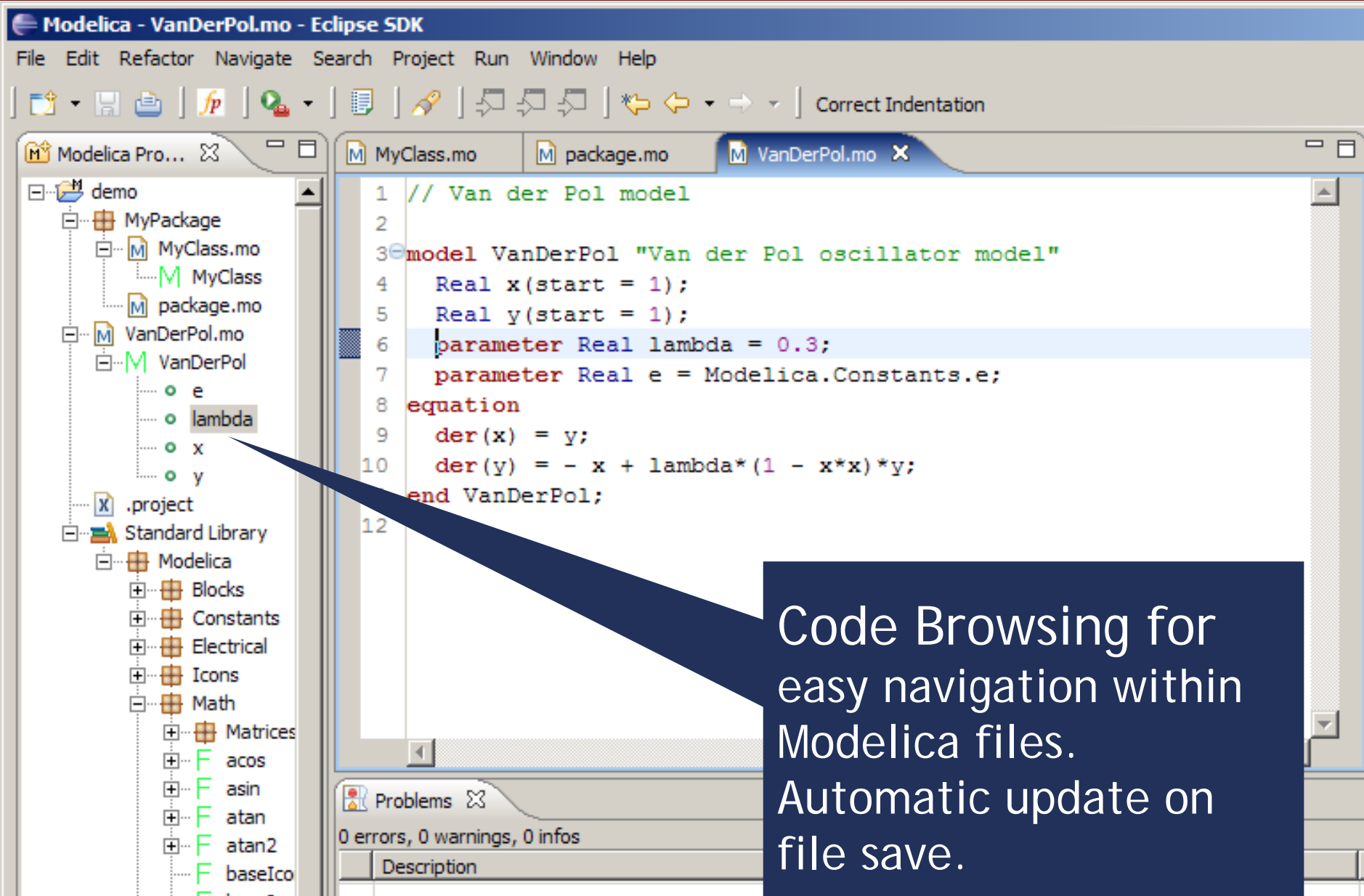
- ☐ include initial equation block
- ☐ is partial class
- ☐ have external body

Finish Cancel

```
1 within MyPackage;  
2  
3 model MyClass  
4  
5 equation  
6  
7 end MyClass;
```

Creation of Modelica classes, models, etc, using wizards

Code browsing



Error detection (I)

The screenshot shows the Eclipse IDE with the title bar "Modelica - VanDerPol.mo - Eclipse SDK". The menu bar includes File, Edit, Refactor, Navigate, Search, Project, Run, Window, and Help. The toolbar contains icons for file operations and development tools. The left sidebar shows a project tree with a "demo" folder containing "MyPackage", "MyClass.mo", "package.mo", and "VanDerPol.mo". The "VanDerPol.mo" file is open in the editor, showing the following code:

```
1 // Van der Pol model
2
3 model VanDerPol "Van der Pol oscillator model"
4   Real x(start = 1);
5   Real y(start = 1);
6   arameter Real lambda = 0.3;
7   parameter Real e = Modelica.Constants.e;
8 equation
9   der(x) = y;
10  der(y) = - x + lambda*(1 - x*x)*y;
11 end VanDerPol;
12
```

A red 'X' icon is next to line 6, indicating an error. The "Problems" window at the bottom shows "1 error, 0 warnings, 0 infos". The error table is as follows:

Description	Resource	In Folder	Location
unexpected token: lambda, parsing resumed at token ';' on line 6, column 29	VanDerPol.mo	demo	line 6

Parse error
detection on
file save

Error detection (II)

The screenshot shows the Eclipse IDE with the Modelica SDK. The left sidebar displays the project structure, including folders like Compiler, doc, modpar, omc_debug, omc_release, report, rml2mmo, rml2sig, runtime, scripts, test_codegen, tools, VC7, winruntime, and files like Absyn.mo, Algorithm.mo, Builtin.mo, Ceval.mo, ClassInf.mo, ClassLoader.mo, Codegen.mo, Connect.mo, Corba.mo, DAE.mo, DAEEXT.mo, DAELow.mo, Debug.mo, and Derive.mo. The main editor shows the Absyn.mo file with the following code:

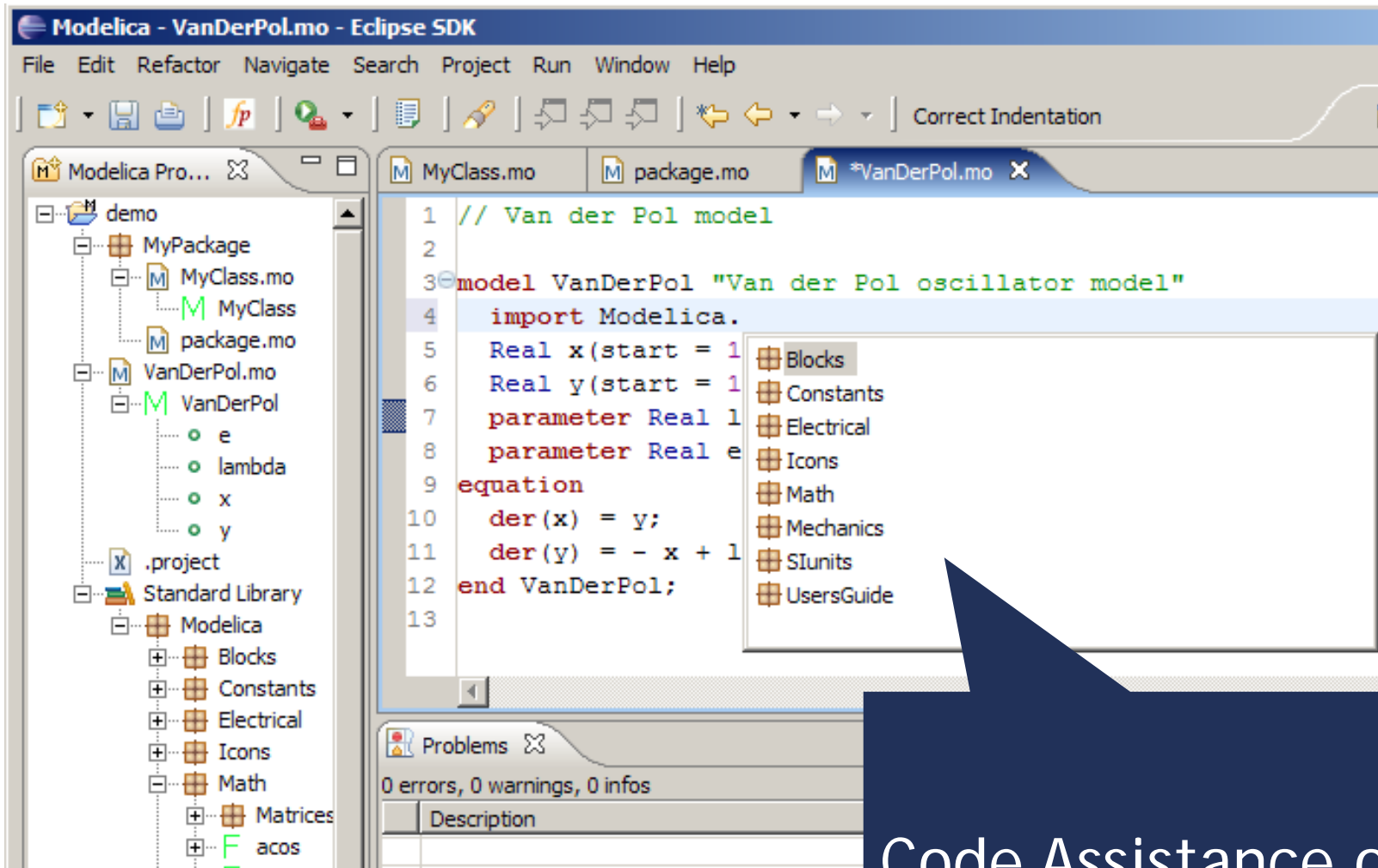
```
69 public
70 uniontype Program "- Programs, the top level construct
71 A program is simply a list of class definitions declared at top
72 level in the source file, combined with a within statement that
73 indicates the hieractical position of the program.
74 "
75 record PROGRAM
76   list<Class> classes "classes ; List of classes" ;
77   Withi within_ "within ; Within statement" ;
78 end PROGRAM;
```

The console output shows the compilation process and the error message:

```
<terminated> OMDev-MINGW-OpenModelicaBuilder [Program] c:\OMDev\tools\msys\bin\make.exe
cp -p ../Static.mo Static.mo
cp -p ../SimCodegen.mo SimCodegen.mo
cp -p ../Values.mo Values.mo
cp -p ../System.mo System.mo
/c/OMDev//tools/rml/bin/rmlc -v -Wc,-O3 -c Absyn.mo
"/c/OMDev//tools/rml/bin/rml" -Eplain Absyn.mo
Absyn.mo:77.5-77.9 Error: unbound type constructor Withi
Error: StaticElaborationError
make[2]: Leaving directory `/c/bin/mingw/home/...
make[1]: Leaving directory `/c/bin/cy/...
make[2]: *** [Absyn.h] Error 1
make[1]: *** [omc_release] Error 2
make: *** [omc] Error 2
```

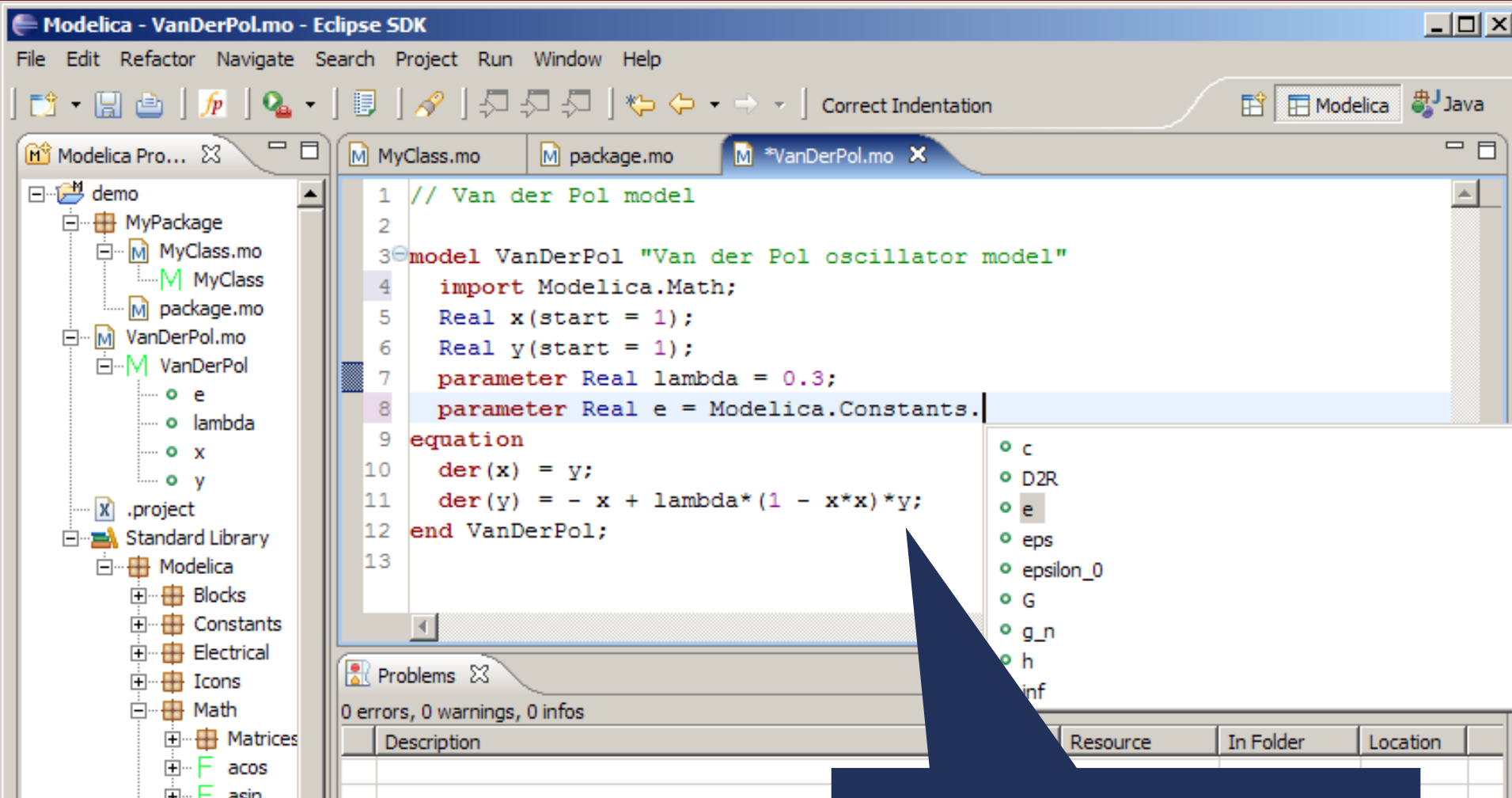
A blue callout box points to the error message with the text "Semantic error detection on compilation".

Code assistance (I)



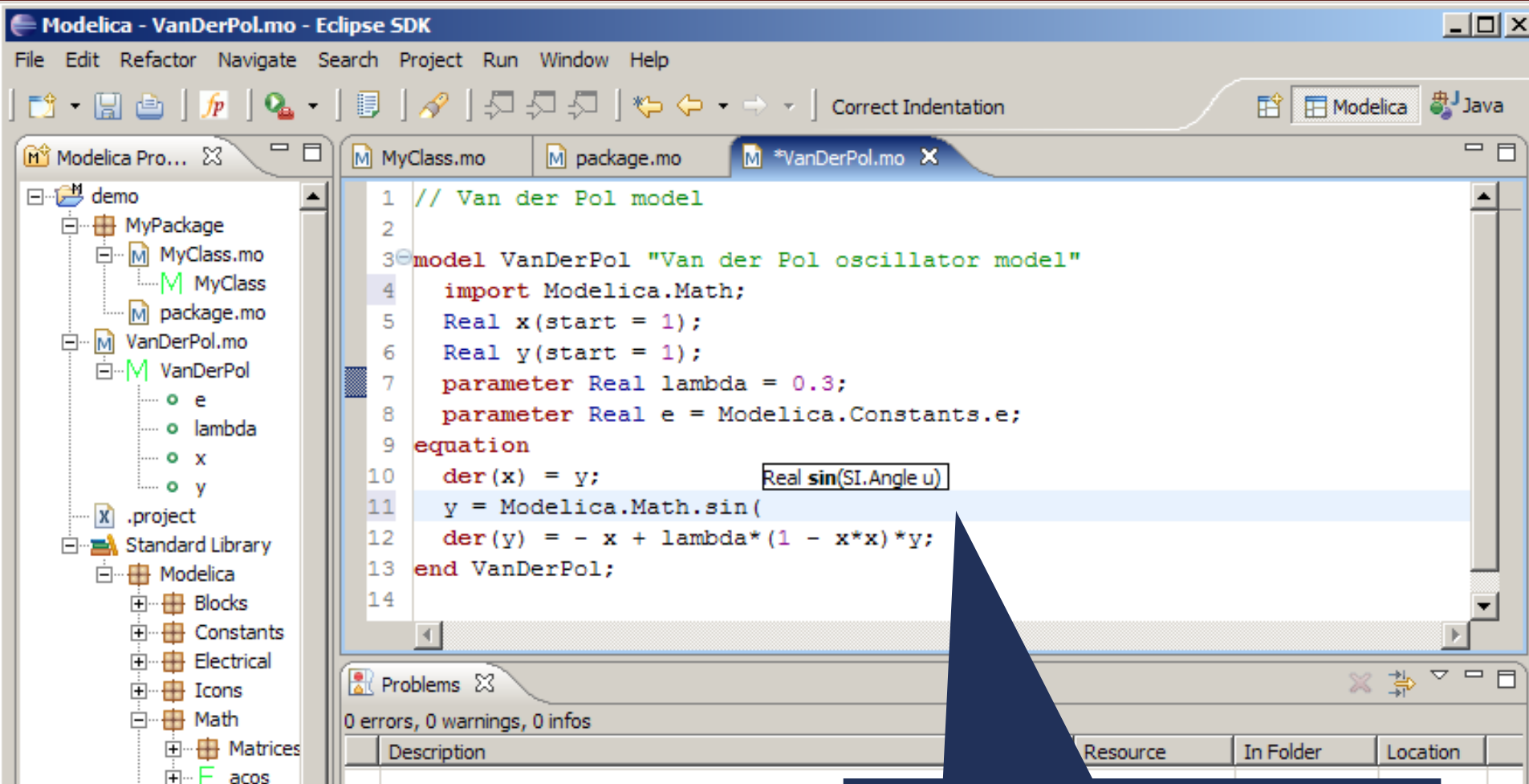
Code Assistance on imports

Code assistance (II)



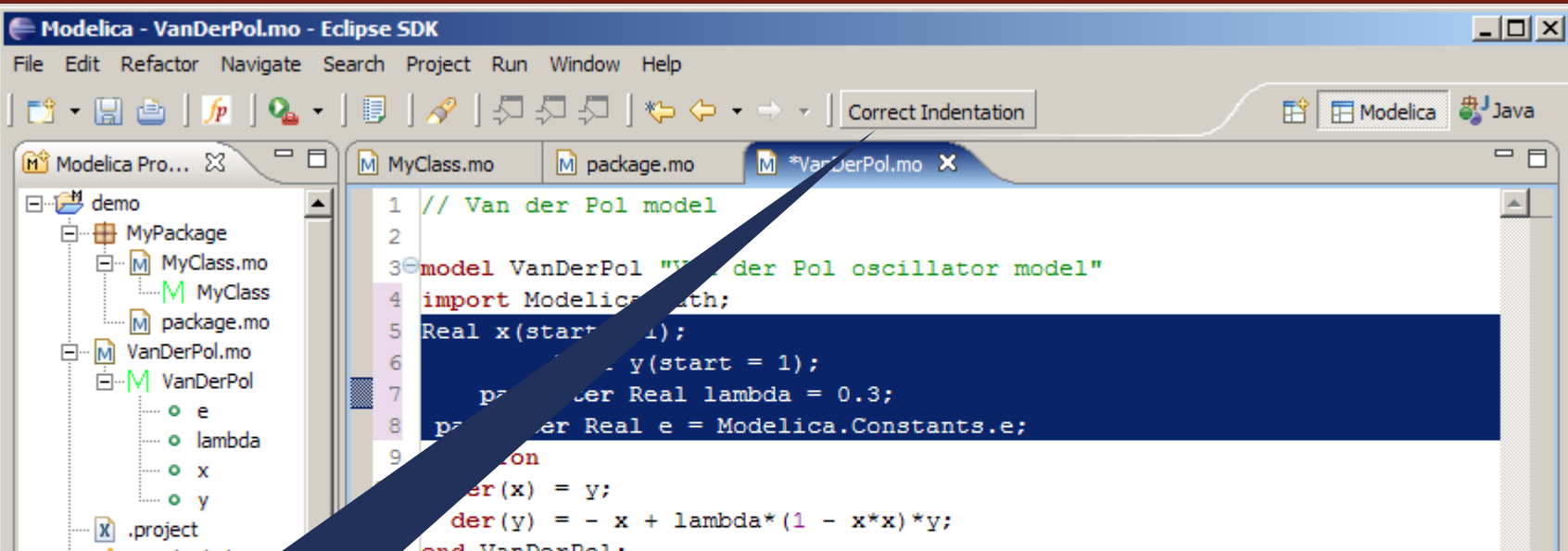
Code Assistance on
assignments

Code assistance (III)

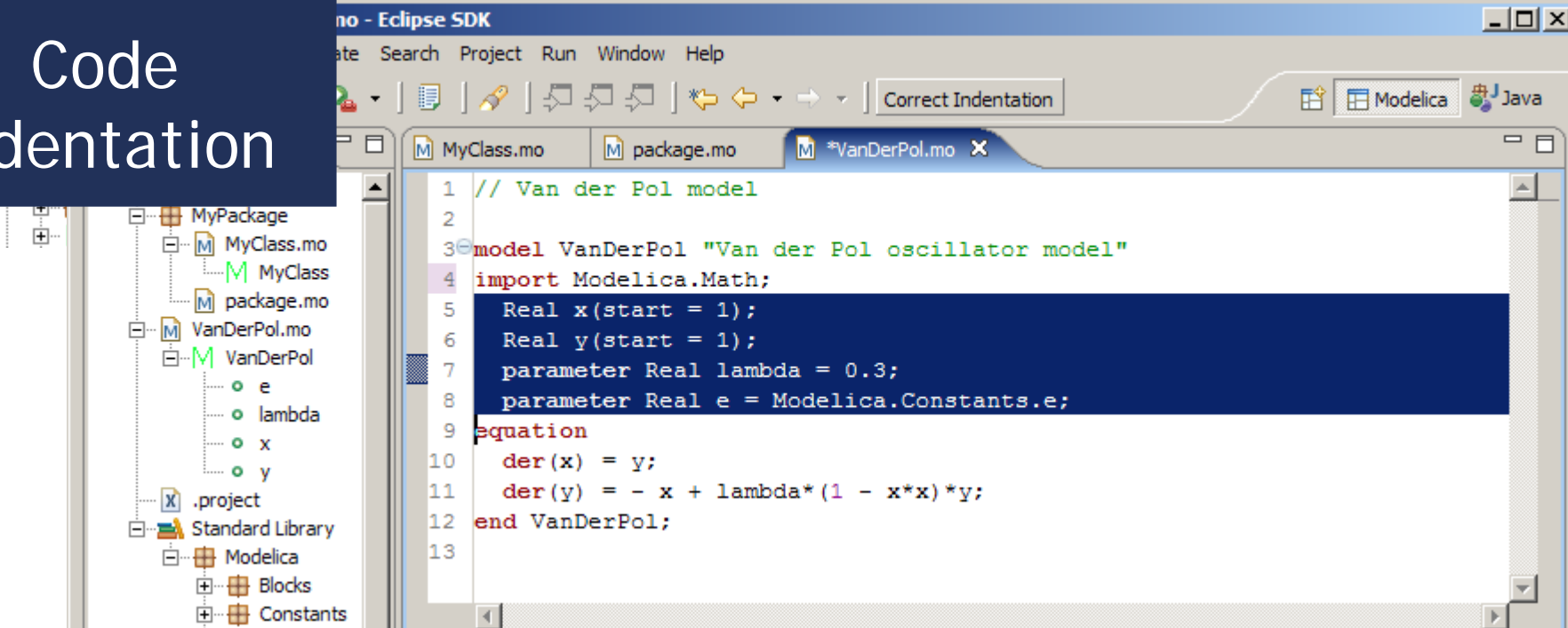


Code Assistance on
function calls

Code indentation



Code
Indentation



Code Outline and Hovering Info

The screenshot displays the Eclipse IDE interface for the Modelica project. The top toolbar includes standard IDE functions like File, Edit, Navigate, Search, Project, Run, Field Assist, Window, and Help. The left sidebar shows the 'Modelica Projects' tree with a list of files including rml2sig, runtime, scripts, test_codegen, tools, VC7, Absyn.mo, and others. The main editor window shows the 'Absyn.mo' file with a code snippet. A tooltip is visible over the 'getCrefFromExp' function, providing its signature and description. The bottom panel shows the 'Problems' view with a list of errors, including 'The identifier at start and end are different'. A large blue arrow points from the text 'Identifier Info on Hovering' to the tooltip. Another large blue arrow points from the text 'Code Outline for easy navigation within Modelica files' to the 'Outline' view on the left.

Modelica - OpenModelica/Compiler/Absyn.mo - Eclipse SDK

File Edit Navigate Search Project Run Field Assist Window Help

Modelica Projects

- rml2sig
- runtime
- scripts
- test_codegen
- tools
- VC7
- Absyn.mo 3116 2008-02-04 14:44 krsta
- Absyn 3116 2008-02-04 14:44 krsta
- Algorithm.mo 2992 2007-12-22 22:17 adrho
- Builtin.mo 3585 2008-05-22 07:03 adrho
- Ceval.mo 3605 2008-05-27 02:48 adrho
- ClassInf.mo 3496 2008-04-23 11:59 krsta
- ClassLoader.mo 3193 2008-02-15 05:17 adrho
- Codegen.mo 3585 2008-05-22 07:03 adrho
- Connect.mo 3584 2008-05-22 06:45 adrho
- Constants.mo 3011 2007-12-22 22:36 adrho
- Convert.mo 3496 2008-04-23 11:59 krsta

Absyn.mo

```
case (MATRIX(matrix = exp11))
  local list<list<list<ComponentRef>>> res1;
  equation
    res1 = Util.listListMap(exp11, getCrefFromExp);
    res2 = Util.listFlatten(res1);
    res = Util.listFlatten(res2);
  then
    res;
case (RANGE(start = e1, step = SOME(e3), stop = e2))
  equation
    l1 = getCrefFromExp(e1);
    l2 =
      function getCrefFromExp "function: getCrefFromExp
        Returns a flattened list of the
        component references in an expression"
        input Exp inExp;
        then
          output list<ComponentRef> outComponentRefList;
        algorithm
          outComponentRefList:=matchcontinue inExp
          local
            l1 =
              ComponentRef cr;
            l2 =
              listAppend(l1, l2);
          then
```

function getCrefFromExp "function: getCrefFromExp
Returns a flattened list of the
component references in an expression"
input Exp inExp;
then
output list<ComponentRef> outComponentRefList;
algorithm
outComponentRefList:=matchcontinue inExp
local
l1 =
ComponentRef cr;
l2 =
listAppend(l1, l2);
then

Outline

- Absyn
 - ADD
 - ALG_ASSIGN(Exp assignComponent, Exp value)
 - ALG_BREAK
 - ALG_CATCH(list<AlgorithmItem> catchBody)
 - ALG_EQUALITY(Algorithm equ)
 - ALG_FAILURE(Algorithm equ)
 - ALG_FOR(ForIterators iterators, list<AlgorithmItem> forBo
 - ALG_GOTO(String labelName)
 - ALG_IF(Exp ifExp, list<AlgorithmItem>
 - ALG_LABEL(String labelName)
 - ALG_NORET_CALL(ComponentRef
 - ALG_RETURN
 - ALG_THROW
 - ALG_TRY(list<AlgorithmItem> tryBody
 - ALG_WHEN_A(Exp whenStmt, list<Alg

Problems

113 errors, 0 warnings, 0 infos

Description

Errors (100 of 113 items)

- The identifier at start and end are different
- The identifier at start and end are different
- The identifier at start and end are different, par

Identifier Info on Hovering

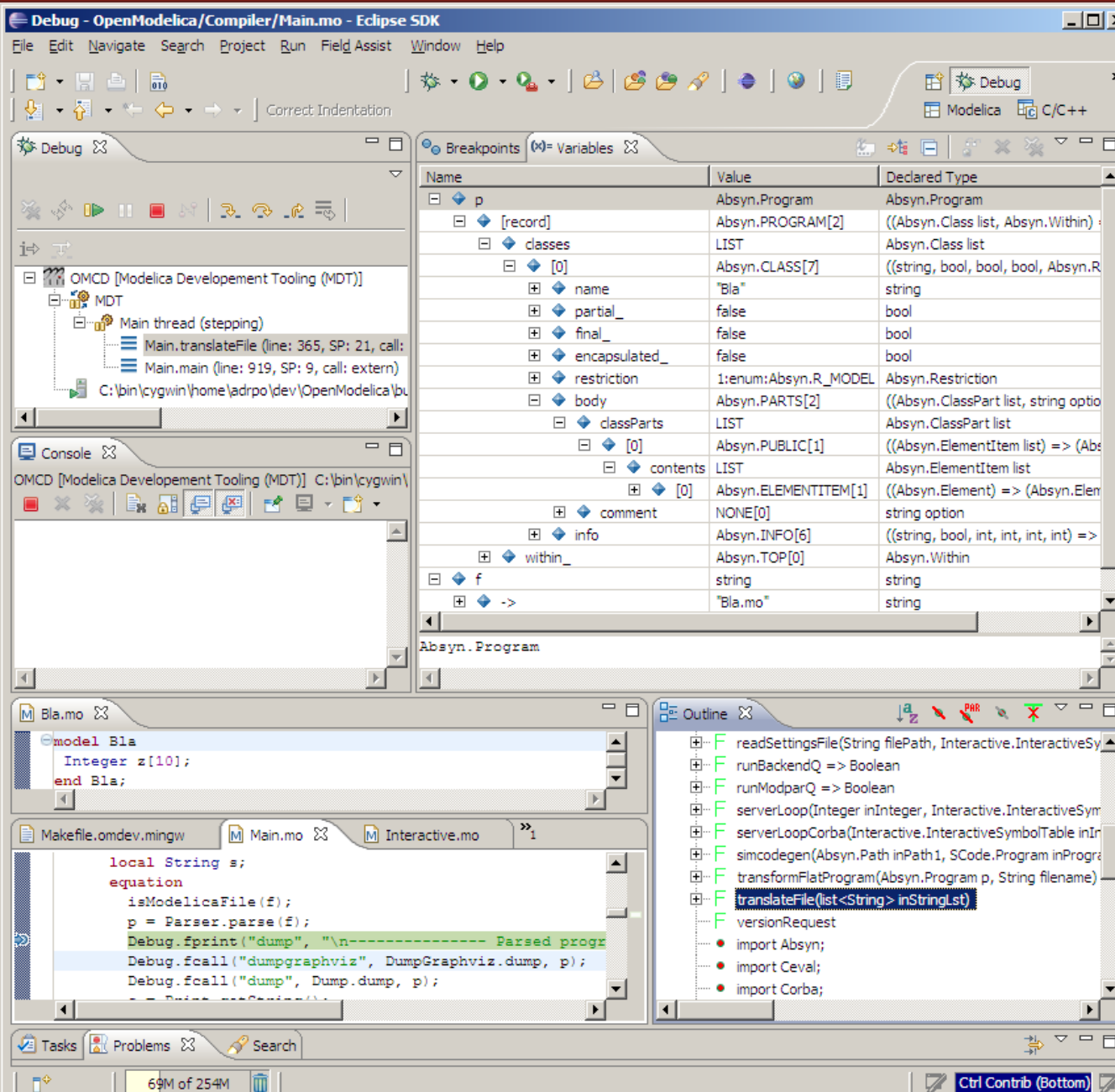
Code Outline for easy navigation within Modelica files

64M of 254M

Ctrl Contrib (Bottom)

Eclipse Debugging Environment

- Type information for all variables
- Browsing of complex data structures
- GDB based



OMEdit Debugging Environment

The screenshot displays the OMEdit - Transformational Debugger interface. The main window is titled "OMEdit - Transformational Debugger" and shows the file path: C:/Users/adeas31/AppData/Local/Temp/OpenModelica/OMEdit/Debugging.SolverFailure.NonlinearSolverSimulation_info.xml.

The interface is divided into several panes:

- Variables Browser:** Contains a "Find Variables" section with a "Case Sensitive" checkbox and a "Regular Expression" dropdown. Below are "Expand All" and "Collapse All" buttons. The "Variables" table lists variables A, Kv, T0, T1, and Tref with their comments, line numbers, and locations.
- Defined In Equations:** A table with columns "Index", "Type", and "Equation". It shows two entries: index 1 (initial) and index 28 (parameter), both with the equation "...* (T0 - Tref)".
- Used In Equations:** A table with columns "Index", "Type", and "Equation". It shows two entries: index 1 (initial) and index 28 (parameter), both with the equation "...* (T0 - Tref)".
- Equations Browser:** Contains a table with columns "Index", "Type", and "Equation". It lists 10 equations, including initial conditions and a nonlinear equation. The "Equation Operations" section shows the solved equations: $h0 = cp * (T0 - Tref)$.
- Source Browser:** Displays the source code for the file C:/Users/adeas31/Desktop/Debugging.mo. The code includes comments and assignments for variables like SI.SpecificHeatCapacity, SI.MassFlowRate, SI.Pressure, SI.Length, and SI.Time.

The "Equations" pane shows the following list of equations:

Index	Type	Equation
1	initial	(assignment) ...* (T0 - Tref)
2	initial	(assignment)...o * y + patm
3	initial	(assignment)..._pump ^ 2.0
4	initial	(assignment)...ump + patm
5	initial	(assignment)... Line: 144")
6	initial	(assignment)...ve = p1 - p2
7	initial	(residual,sqr...5 - dp_valve)
8	initial	(nonlinear)
3	initial	(assignment)..._pump ^ 2.0
4	initial	(assignment)...ump + patm
5	initial	(assignment)... Line: 144")
6	initial	(assignment)...ve = p1 - p2
7	initial	(residual,sqr...5 - dp_valve)
9	initial	(assignment)..._4(String)#)
10	initial	(assignment)...a3

The "Equation Operations" section shows the solved equations:

```
solved: h0 = cp * (T0 - Tref)
solved: h0 = cp * (T0 - Tref)
```

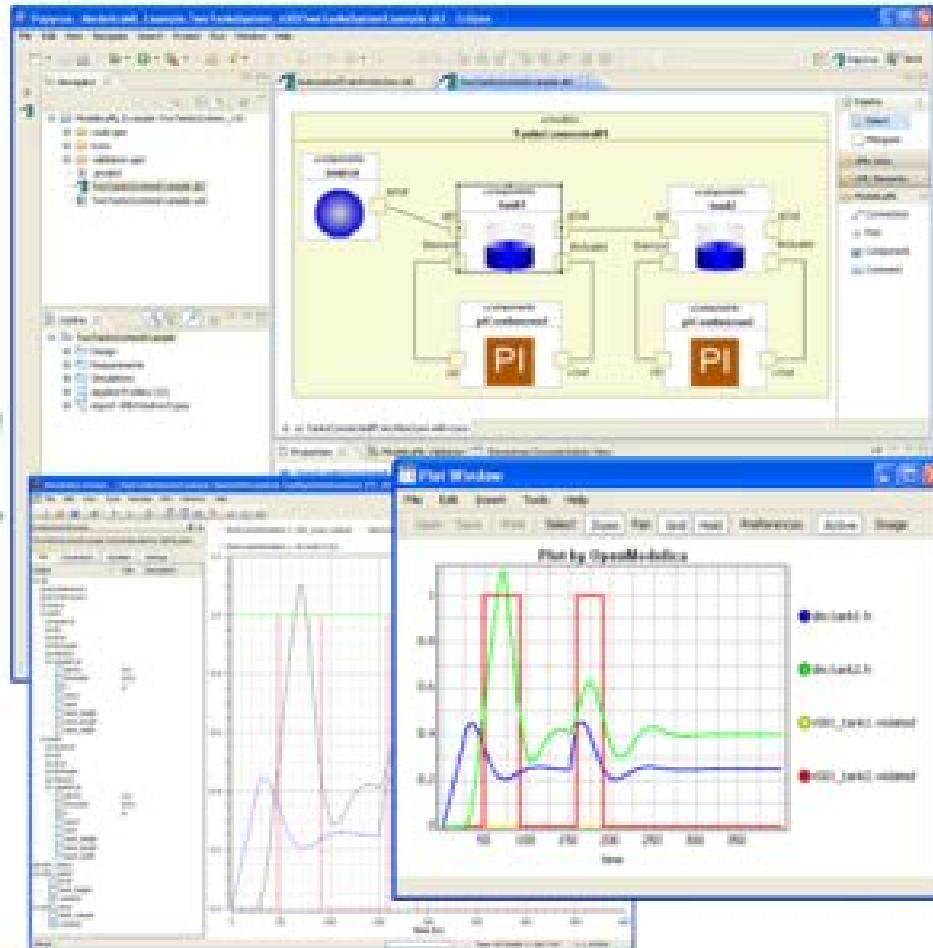
The "Source Browser" pane shows the following code snippet:

```
enthalpy computation";
parameter
SI.SpecificHeatCapacity
cp=4186 "Cp of the fluid";
SI.MassFlowRate w_pump
"Mass flow rate from the
pump";
SI.Pressure p1 "Pump
discharge pressure";
SI.Pressure p2 "Storage
tank inlet pressure";
SI.Pressure dp_pump
"Pump dp";
SI.Pressure dp_valve
"Valve dp";
Real sqrt_dp
"Regularized sqrt(dp)";
SI.SpecificEnthalpy h0
"Pump inlet specific
enthalpy";
SI.SpecificEnthalpy h1
"Pump discharge specific
enthalpy";
SI.Power W;
SI.Length y(start=40,
fixed=true) "Reservoir
level";
Real eta(final
unit="1") = (p1 -
patm)*w_pump/rho/W "Pump
efficiency";
SI.Temperature T1 "Pump
discharge temperature";
SI.Time tau=1 "Time
constant of temperature
sensor";
equation
dp_pump = p1 - patm
dp";
```

Tutorial 1 - tomorrow at ModProd 2018!

Eclipse environment for ModelicaML

1 System Modeling with ModelicaML



② Modelica Code Generation

[illegible]

③ System Simulation with Modelica Tools

- OpenModelica
 - What is OpenModelica?
 - The past
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook,
 - OMEdit, ModelicaML
- OpenModelica Development Environment
 - MetaModelica
 - The Eclipse Environment
- OpenModelica Latest Developments (2017-2018)

Latest Developments (2017-2018) (I)

- 2017 - 2018 - focus on testing, performance, scalability, bug fixes, usability
- OMC & Clients
 - Performance & scalability improvements
 - DAEMode improvements
 - Automatic parallelization of models
 - Bug fixes to OMC, OMEdit, FMI
- General
 - Feb 2015 - Feb 2016
 - 20 contributors
 - 797 commits (OMCompiler)
 - Better testing facilities
 - Releases 1.11.0, 1.12.0

Latest Developments (2017-2018) (II)

■ New Front-End - status

- Work is progressing on the new front-end ~70% complete, more developers are working in parallel (see #4138 on Trac)
- 10+ times faster, 5+ times less memory consumption (no array expansions, no expansion of for loops in equations)
- The new front-end also brings better support for libraries
- Developed in line with MCP-0019: Flattening
- Currently around 107 models from MSL 3.2.2 pass the new front-end

■ New Front-End - remaining work

- Overconstrained CG support
- Overloaded operators
- Vectorization
- Some class extends cases
- Support for state machines
- (Support for MetaModelica)

Latest Developments (2017-2018) (III)

- OMEdit - better Modelica support
 - Much more stable OMEdit, a lot of bug fixes and new usability features
- Redeclare and Replaceable Support
 - OMC: build the inheritance information on Modelica file loading for fast query API of subtypeof; new query API for getting components and modifications that include replaceable elements, Modelica based; use the new front-end to do instantiation and to get context information for replaceable modifications and base classes
 - OMParser: new antlr4 based C++ parser for Modelica to parse the modifications given by the new query API
 - OMEdit: use OMParser and query API to build a parameter dialog that include redeclare choices for replaceable and edit their parameters

Latest Developments (2017-2018) (IV)

- OMC / OMEdit - new API for instance hierarchy editing
 - Concept testing - work in progress
 - Use the new front-end to instantiate the Model
 - Give the instance tree to OMEdit, automatically generated C++ classes for walking the tree
 - Allow OMEdit to edit the instance tree directly
 - Propagate the instance tree edits to the top level class
 - Build a simulation from the changed instance tree
- Julia - OMC interaction
 - Concept testing - work in progress
 - Change MetaModelica objects to use Julia structure
 - <https://docs.julialang.org/en/stable/devdocs/object/>
 - already MM objects are very similar to Julia
 - Benefits
 - Allow Julia to access the MM objects directly without translation
 - Write OMC phases in Julia
 - Maybe use Julia garbage collector instead of Boehm GC

Thank You!

Questions?

asodja, sjoelund.se, sebco011, lochel, wbraun, niklwors, hubert.thieriot, petar, perost, Frenkel TUD, Unknown, syeas460, adeas31, ppriv, ricli576, haklu, dietmarw, lersa, mahge930, x05andfe, mohsen, nutaro, x02lucpo, florox, x06hener, x07simbj, stebr461, x08joekl, x08kimja, Dongliang Li, jhare950, x97davka, krsta, edgarlopez, hanke, henjo, wuzhu.chen, fbergero, harka011, tmtuomas, bjozac, AlexeyLebedev, x06klasj, ankar, kajny, vasaie_p, niemisto, donida, hkiel, darbr, otto@mathcore.com, Kaie Kubjas, x06krino, afshe, x06mikbl, leonardo.laguna, petfr, dhedberg, g-karbe, x06henma, abhinck, azazi, x02danhe, rruusu, x98petro, mater, g-bjoza, x02kajny, g-pavgr, x05andre, vaden, jansilar, ericmeyers, x05simel, andsa, leist, choeger, Ariel.Liebman, frisk, vaurich, mwalther, mtiller, ptauber, casella, vitalij, hkiel, jank, rfranke, mflehmg, crupp2, kbalzereit, marchartung, adrho

OpenModelica Project

<http://www.OpenModelica.org>