

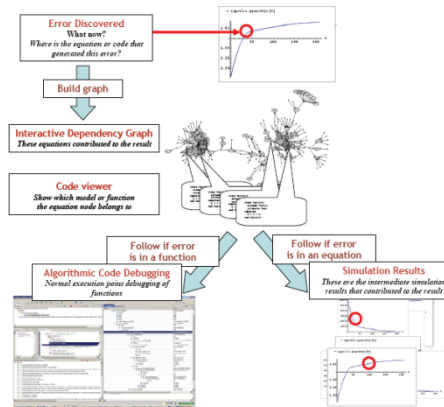
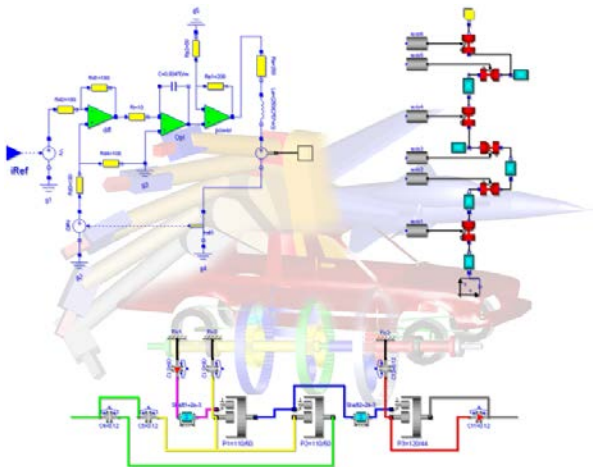
OpenModelica.org

Presentation, Status and Future Developments

Adrian.Pop@liu.se

2023-02-06

Open Source Modelica Consortium
PELAB, Linköping University
RISE, Research Institutes of Sweden



- **OpenModelica**
 - What is OpenModelica?
 - The past
- **OpenModelica Technical Overview**
 - OMC, OMShell, OMNotebook, OMEdit, ModelicaML, OMSimulator, OMPython, OMJulia, OMMatlab
- **OpenModelica Development Environment**
 - MetaModelica
 - The Eclipse Environment (MDT)
- **OpenModelica Latest Developments (2022-2023)**

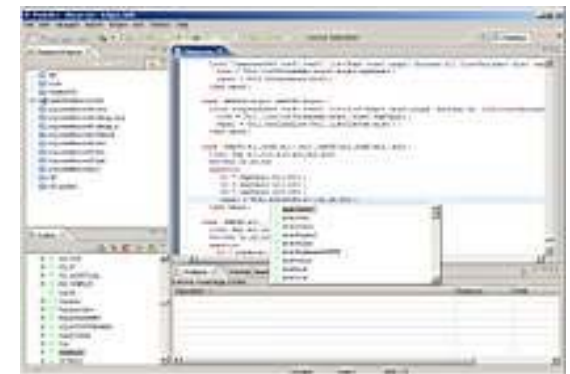
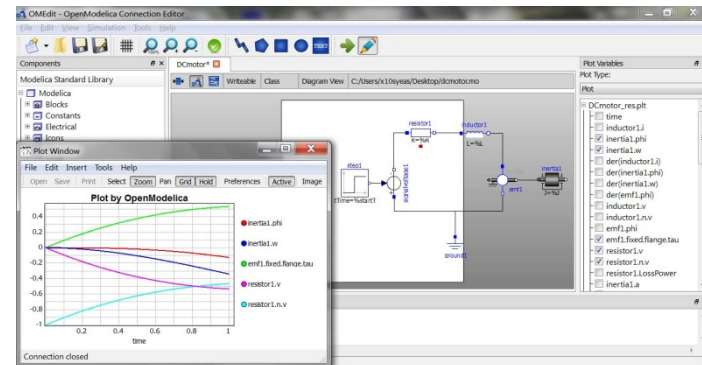
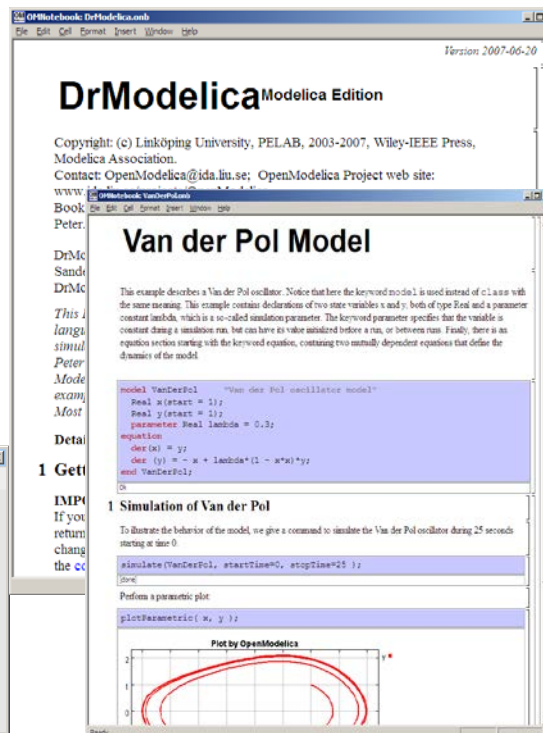
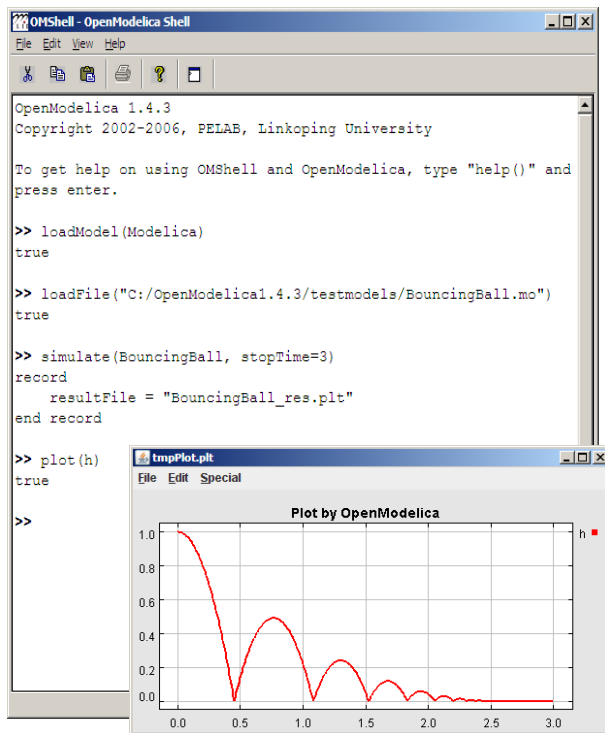
OpenModelica is ... its developers,
testers, bug reporters, contributors
and OSMC members

Thank you!

abhinnk, achary, adeas31, adrpo, afshe, alash325, alexchandel, AlexeyLebedev, Andreas, andsa, AntHeuermann, ankar, anotheruserofgithub, Ariel, arun3688, a-severin, asodja, atosinenko, azazi, bernhardbachmann, bernhard-thiele, bjozac, casella, choeger, chrjo5, crupp2, davbr, david-polak, dhedberg, dietmarw, Dongliang Li, donida, edgarlopez, ericmeyers, farkasrebus, fbergero, florosx, frape315, Frenkel TUD, frisk, friskerik, fritzmark, g-bjoza, g-karbe, g-pavgr, haklu, hanke, harka011, henjo, henrikt-ma, hkiel, hubert, jank, jansilar, jensdo, jgillis, jhare950, JKRT, joshbode, jschueller, k Abdelhak, Kaie Kubjas, kajny, Karim, kbalzereit, krsta, laguna, leist, lenaRB, leonardo, leo-recover, lersa, Liebman, lochel, mahge, mahge930, marchartung, mater, mflehmg, modlfo, mohsen, mtiller, mwalther, niemisto, niklwors, nimen, nutaro, ofstardust, otto@mathcore.com, pavolpr, perost, petar, petr, phannebohm, pierre-haessig, ppriv, ptaeber, ptauber, rahulp13, rakhiwarriar, rbulatow, rfranke, ricli576, robbr48, rruusu, RuedKamp, sanguinariojoe, sebco011, SimplyDanny, sjoelund.se, sjoelund, smiz, sp1187, spinnau, stebr461, sturmck, syeas460, tbeu, thieriot, thorade, tmtuomas, Unknown, vaden, vasaie_p, vaurich, vitalij, vomiskam, vruge, vwaurich, wbraun, wibraun, wuzhu.chen, x02danhe, x02kajny, x02lucpo, x05andfe, x05andre, x05simel, x06hener, x06henma, x06klasj, x06krino, x06mikbl, x07simbj, x08joekl, x08kimja, x97darka, x98petro

What is OpenModelica? (I)

- Advanced Interactive Modelica compiler (OMC)
 - Supports MSL v4.0.0/v3.2.3/master
- 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/OMJulia/OMMatlab - OpenModelica Python/Julia/Matlab Environment
 - MDT - an advanced textual environment in Eclipse
 - OMSimulator - co-simulation of composite models using FMUs or via TLM
 - OM.jl - Julia-based framework



What Is OpenModelica? (II)

- Advanced Eclipse-based Development Environment
- Modelica Development Tooling (MDT) - started in 2005
 - Code Assistance, Debugging, Outline & a lot more
 - *Used for OpenModelica development*
 - Used in many OpenModelica Development Courses
 - *Should be 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 (New) and Support Forum
 - Source versioning (github.com)
 - Trac with bug database (->Github)
 - Development courses
 - Mailing lists

The screenshot shows the OpenModelica website homepage. The header includes the OpenModelica logo and navigation links: Home, Download, Users, Developers, Events, Research. The main content area is titled "Introduction" and contains several paragraphs of text. A "Latest news and events" section lists various releases and conferences. There are also video thumbnails for "Overview of Mo..." and "Modelica Cyber...".

Introduction

OPENMODELICA is an open-source Modelica-based¹ 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). An overview journal paper is available and slides about Modelica and OpenModelica.

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.

Join the OpenModelicaInterest mailing list to get information about new releases.

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.

Interactive step-by-step beginners Modelica on-line spoken tutorials
Interactive OMWebbook with examples of Modelica textual modeling and textbook companions with application OpenModelica exercises. A Jupyter notebook Modelica mode, available in OpenModelica.

To get advice how to make existing Modelica libraries work in OpenModelica, see [Porting](#).

For systems engineering with requirement traceability and verification, see [ModelicaMIL](#).

OpenModelica provides [library coverage reports](#) of open-source Modelica libraries showing which libraries work well with OpenModelica and how the support improved over time.

Latest news and events

- 2023-02-07-2023-02-08 MODPROD 2023
- 2023-02-06 OpenModelica 2023
- 2022-12-07 OpenModelica 1.20.0 released!
- 2022-11-24-2022-11-25 Asian Modelica Conference 2022
- 2022-11-18 OpenModelica 1.20.0-dev.beta2 released!
- 2022-10-26-2022-10-28 American Modelica Conference 2022
- 2022-07-09 OpenModelica 1.19.2 released!
- 2022-06-01 OpenModelica 1.19.0 released!
- 2022-04-20 OpenModelica 1.19.0-dev.beta1 released!
- 2022-01-31 OpenModelica 2022
- 2021-12-23 OpenModelica 1.18.1 released!
- 2021-09-20-2021-09-24 International Modelica Conference 2021
- 2021-07-12 OpenModelica 1.18.0-dev.beta1 released!
- 2021-03-23 OpenModelica 1.17.0 released!
- 2021-02-22 OpenModelica 1.16.4 released!
- 2021-02-03-2021-02-04 MODPROD 2021
- 2021-02-02 OpenModelica 2021
- 2020-12-21 OpenModelica 1.16.2 released!
- 2020-11-17 OpenModelica 1.16.1 released!
- 2020-10-24 OpenModelica 1.16.0 released!

¹ This page references Modelica®, which is a registered trademark of Modelica Association. ²

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The screenshots show the GitHub repository for OpenModelica. The top screenshot is the repository overview page, showing the OpenModelica logo, navigation links, and a list of pinned repositories: OpenModelica (Public), OMSimulator (Public), and OMuLLi.jl (Public). The middle screenshot shows the repository page for OpenModelica / OpenModelica, with tabs for Code, Issues, Pull requests, Discussions, Actions, Projects, Wiki, Security, and Insights. The bottom screenshot shows the Issues page, displaying a list of open issues with filters for labels, milestones, and a "New issue" button. The issues listed include "Unit multiples in plots should not be used when powers are involved", "Incorrect behaviour of drop-down unit menu for parameter inputs", "displayUnits as axis labels", and "dropdown for replaceable functions not shown in parameter window".

OpenModelica Project

- 1,960 Open • 4,785 Closed
- Unit multiples in plots should not be used when powers are involved **COMPLIANCE**
- Incorrect behaviour of drop-down unit menu for parameter inputs **COMPLIANCE** **enhancement**
- displayUnits as axis labels **COMPLIANCE**
- dropdown for replaceable functions not shown in parameter window

Documentation

- Automatically generated
- Writing efficient MetaModelica
- Modelica Compliant Libraries

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

The graph shows the MSL 3.2.1 Coverage over time. The Y-axis is labeled "Models" and ranges from 0 to 300. The X-axis is labeled "Date 2012-10-20 - 2014-01-31" and shows dates from 11-01 to 01-01. The legend indicates: Target: 274 (red line), Compile: 269 (green line), Simulate: 249 (blue line). The coverage increases over time, reaching the target of 274 models by late 2013.

ModelicaTest 3.2.1 Coverage

The graph shows the ModelicaTest 3.2.1 Coverage over time. The Y-axis is labeled "Models" and ranges from 0 to 400. The X-axis is labeled "Date 2012-10-20 - 2014-01-31" and shows dates from 11-01 to 01-01. The legend indicates: Target: 431 (red line), Compile: 414 (green line), Simulate: 395 (blue line). The coverage increases over time, reaching the target of 431 models by late 2013.

What is OpenModelica? (IV)

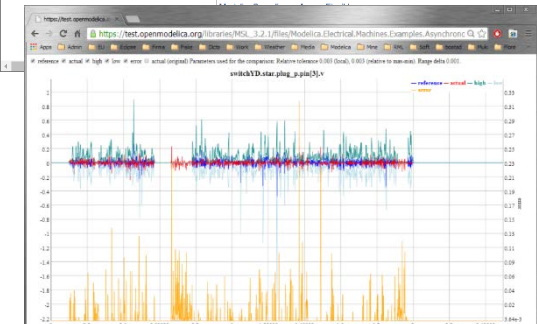
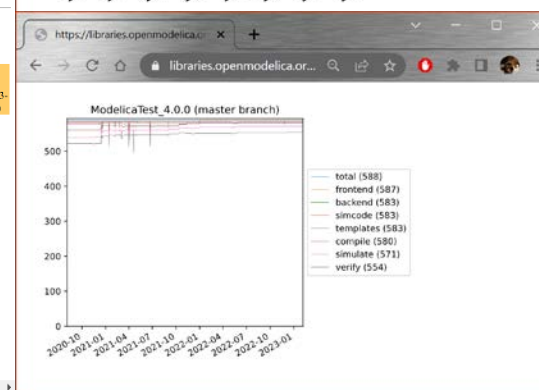
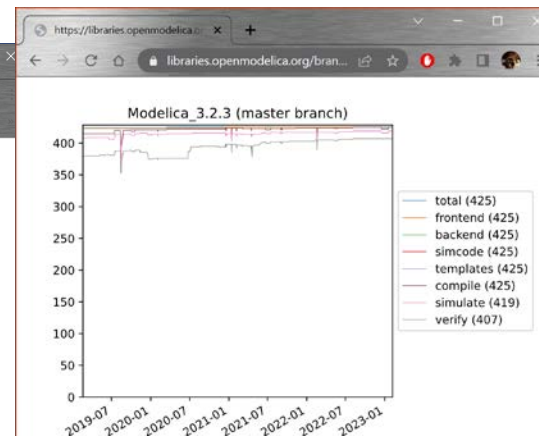
Open-source community services

- Extensive testing (unit & library coverage: 80 libraries, 15267 models) with interactive result comparison. 10+ test servers currently
 - <https://libraries.openmodelica.org/branches/overview-combined.html>
 - Linux (GCC & CLANG), Windows (MinGW GCC & Clang), Mac OS (GCC & Clang)
 - Platforms: x86, x86_64, ARM, M1, M2
 - 3 runtimes: FMI, C runtime, C++ runtime
- ~10,449 tests ran on each pull request via Hudson
- Automatic nightly builds for Window & Linux & Mac OS

Branch	Version	Build time	Execution time	# Simulate	# Total
v1.8.1-uml	1.8.1 (r11645+2)	2019-04-06 07:30:16 2 days, 7:02:18	1461	12322	
v1.9.0-uml	1.9.0 (r17627)	2020-11-15 08:03:08 3 days, 19:57:56	6259	16395	
v1.9.1	1.9.1 (r22929) (Bootstrapping version)	2021-01-23 04:24:29 16:19:29	742	16441	
v1.9.2	1.9.2 (r25115 C++)	2021-01-23 04:37:39 2 days, 1:48:43	4291	16441	
v1.9.3	OpenModelica 1.9.3	2018-06-09 07:30:59 2 days, 1:36:35	5762	10832	
v1.9	v1.9.7-v1.9.7.3-g5c347e18f1	2021-01-23 04:51:36 1 day, 15:49:42	5267	16441	
v1.11	v1.11.0-v1.11.0.8-gbde991e5b	2021-01-23 05:05:00 1 day, 11:43:55	5395	16441	
v1.12	OMCCompiler v1.12.0-v1.12.0.7 ga21325026	2021-01-23 05:18:16 2 days, 1:51:22	5598	16441	
v1.13	OMCCompiler v1.13.2	2021-01-23 05:31:29 2 days, 20:44:05	12372	15079	
v1.14	OMCCompiler v1.14.2-v1.14.2.6-g5c52d52477	2021-01-22 12:41:08 3 days, 0:34:32	12575	15079	
v1.16	OMCCompiler v1.16.1-v1.16.1.15-gfd2a6c15b	2021-01-22 12:40:03 3 days, 2:17:46	12408	15079	
master	OMCCompiler v1.18.0-dev.-g263a0c58c8	2021-01-29 21:59:28 2 days, 15:46:18	13692	16441	

Branch	Version	Build time	Execution time	# Simulate	# Total
v1.8.1-uml	1.8.1 (r11645+2)	2019-04-06 07:30:16 2 days, 7:02:18	1461	12322	
v1.9.0-uml	1.9.0 (r17627)	2020-11-15 08:03:08 3 days, 19:57:56	6259	16395	
v1.9.1	1.9.1 (r22929) (Bootstrapping version)	2021-01-23 04:24:29 16:19:29	742	16441	
v1.9.2	1.9.2 (r25115 C++)	2021-01-23 04:37:39 2 days, 1:48:43	4291	16441	
v1.9.3	OpenModelica 1.9.3	2018-06-09 07:30:59 2 days, 1:36:35	5762	10832	
v1.9	v1.9.7-v1.9.7.3-g5c347e18f1	2021-01-23 04:51:36 1 day, 15:49:42	5267	16441	
v1.11	v1.11.0-v1.11.0.8-gbde991e5b	2021-01-23 05:05:00 1 day, 11:43:55	5395	16441	
v1.12	OMCCompiler v1.12.0-v1.12.0.7 ga21325026	2021-01-23 05:18:16 2 days, 1:51:22	5598	16441	
v1.13	OMCCompiler v1.13.2	2021-01-23 05:31:29 2 days, 20:44:05	12372	15079	
v1.14	OMCCompiler v1.14.2-v1.14.2.6-g5c52d52477	2021-01-22 12:41:08 3 days, 0:34:32	12575	15079	
v1.16	OMCCompiler v1.16.1-v1.16.1.15-gfd2a6c15b	2021-01-22 12:40:03 3 days, 2:17:46	12408	15079	
master	OMCCompiler v1.18.0-dev.-g263a0c58c8	2021-01-29 21:59:28 2 days, 15:46:18	13692	16441	

Branch	Version	Total	Parsing	Frontend	Backend	SimCode	Templates	Compilation	Simulation	Verification
v1.8.1-uml	1.0.0	15	15	0	0	0	0	0	0	0
v1.9.0-uml	1.0.1 (revision)	15	15	0	0	0	0	0	0	0
v1.9.1	1.0.1-20190515-1.0.1-rc1-3-g5ce57ac	15	15	0	0	0	0	0	0	0
v1.9.2	1.0.0-5-172471-git-master	15	15	0	0	0	0	0	0	0
v1.9.3	1.0.1-rc1-3-g5ce57ac	15	15	0	0	0	0	0	0	0
v1.9	1.0.0-5-172471-git-master	15	15	0	0	0	0	0	0	0
v1.11	1.0.1-rc1-3-g5ce57ac	15	15	0	0	0	0	0	0	0
v1.12	1.0.0-5-172471-git-master	15	15	0	0	0	0	0	0	0
v1.13	1.0.1-rc1-3-g5ce57ac	15	15	2	2	2	2	1	0	0
v1.14	1.0.1-rc1-3-g5ce57ac	15	15	2	2	2	2	1	1	0
v1.16	1.0.1-rc1-3-g5ce57ac	15	15	2	2	2	2	2	2	0
master	1.0.1-rc1-3-g5ce57ac	15	15	2	2	2	2	4	4	0



What is OpenModelica? (V)

- **An incubator platform for research**
 - 9 PhDs since 2004 (Debugging, Parallelization, PDEs Extensions)
 - 40 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, RTE

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 - 2017 - 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)

OpenModelica Roadmap – Past

- 2018 - 2019 - focus on performance, scalability, bug fixes
- OMC & Clients
 - Performance & scalability improvements
 - Bug fixes to OMC, OMCedit, FMI
- OMSimulator
 - Combined FMI & TLM support, SSP support
 - OMCedit GUI support
- OMJulia
 - API to access OpenModelica from Julia
- General
 - From Feb 2018 - Feb 2019
 - 30+ contributors
 - 800 commits (OMCompiler)
 - 969 commits (OMSimulator)
 - 213 commits (OMCedit)
 - Releases 1.13.0, 1.13.1, 1.13.2

OpenModelica Roadmap - Past

- 2018 - 2019 - focus on performance, scalability, bug fixes
- **New Front-End - status**
 - The new front-end ~90% complete, (see #4138 on Trac)
 - 100+ 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 423/424 models from MSL 3.2.3 pass the new front-end
 - Last year 107/387 models from MSL 3.2.3 passed the new front-end
- **New Front-End - remaining work**
 - Expandable connectors (add virtual nodes)
 - Making the backend cooperate with the new way the DAE is produced
 - Support for state machines
 - (Support for MetaModelica)

OpenModelica Roadmap - Past

- 2018 - 2019 - focus on performance, scalability, bug fixes
- OMEdit - better Modelica support
 - Much more stable OMEdit, a lot of bug fixes and new usability features
 - Auto completion support
 - Support for OMSimulator
- Redeclare and Replaceable Support
 - Waiting for the new front-end to become mature enough so we don't frustrate users

- 2019 - 2020 - focus on performance, scalability, bug fixes
- OMC & Clients
 - Performance & scalability improvements
 - Bug fixes to OMC, OMCedit, FMI
- OMSimulator
 - Combined FMI & TLM support, SSP support
 - OMCedit GUI support
- General
 - From Feb 2019 - Feb 2020
 - 30+ contributors
 - 929 commits (OpenModelica/OMCompiler/OMCedit)
 - 100 commits (OMSimulator)
 - Releases 1.13.2, 1.14.1

OpenModelica Roadmap – Past

- 2020 - 2021 - focus on performance, scalability, bug fixes
- OMC & Clients
 - Performance & scalability improvements
 - Bug fixes to OMC, OMCedit, FMI
 - First replaceable support in OMCedit
 - New Fronted by default in 1.16.x
 - Better FMI export
- OMSimulator
 - Combined FMI & TLM support, SSP support
 - OMCedit GUI support
- General
 - From Feb 2020 - Feb 2021
 - 33+ contributors
 - 878 commits (OpenModelica/OMCompiler/OMCedit)
 - 139 commits (OMSimulator)
 - Releases 1.16.x

OpenModelica Roadmap - Past

- 2021 - 2022 - focus on library coverage, mostly Buildings
- OMC & Clients
 - Performance & scalability improvements
 - Bug fixes and enhancements to OMC, OMEdit, FMI, Runtime, Backend, etc.
 - Replaceable support in OMEdit
 - New Fronted by default in 1.16.x in OMEdit, 1.17.x by default in OMC
 - Some FMI export fixes and enhancements
 - Fixes and improvements in the C++ runtime - better coverage <https://libraries.openmodelica.org/branches/overview-c++.html>
 - Reimplementation of synchronous features
- OMSimulator
 - Improved SSP support better OMEdit integration
- General
 - From Feb 2021 - Feb 2022
 - 33+ contributors
 - 930 commits (OpenModelica/OMCompiler/OMEdit)
 - 135 commits (OMSimulator)
 - Releases 1.17.x, 1.18.x

■ Testing procedure

- <https://libraries.openmodelica.org/branches/overview-combined.html>
- Run tests on previous OpenModelica version until 1.12.x
- Detect both model regression and performance regression, all information saved in a database
- 65 libraries, 15067 models with interactive result comparison.
 - 10+ dedicated test servers
 - Linux (GCC & CLANG), Windows (MinGW GCC), Mac OS (GCC)
 - Platforms: x86, x86_64, ARM, M1, M2
 - 5 runtimes: FMI, C runtime, C++ runtime, oldInst, daeMode

Statistics

Number of libraries 65

Number of models 15067

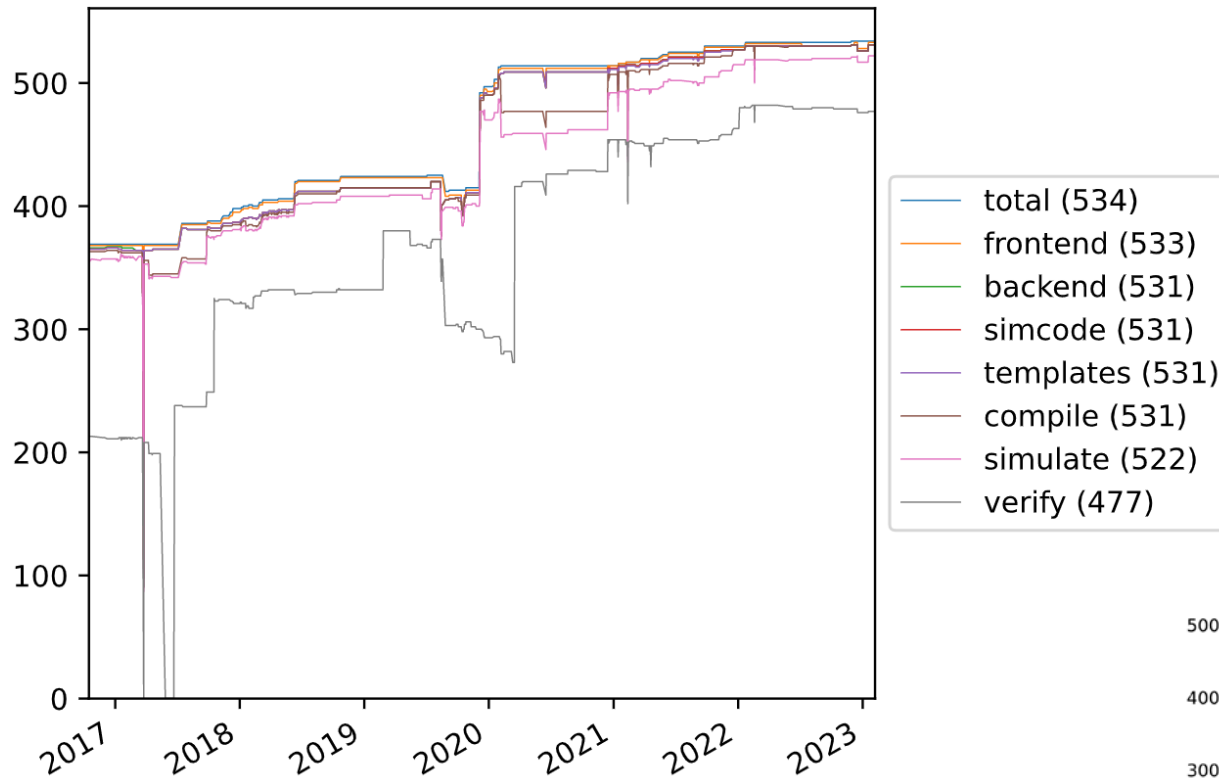
Tested branches

Branch	Version	Build time	Execution time	# Simulate	# Total
v1.12	OMCompiler v1.12.0-v1.12.0.7+ga21325026	2023-02-04 04:08:09	4 days, 14:22:45	10527	15067
v1.13	OMCompiler v1.13.2	2023-02-04 06:07:24	2 days, 12:11:50	10708	15067
v1.14	OMCompiler v1.14.2-v1.14.2.6+g5c52d52477	2023-02-04 07:14:33	2 days, 15:39:34	10864	15067
v1.16	OMCompiler v1.16.5-v1.16.5.1+g6adae6a043	2023-02-04 08:24:13	2 days, 14:00:15	10722	15067
v1.17	OMCompiler v1.17.0-v1.17.0.10+g03f0da6bf5	2023-02-04 09:36:10	2 days, 0:37:58	11394	15067
v1.18	OMCompiler v1.18.0-v1.18.0.38+ga767f054d8	2023-02-04 10:35:55	2 days, 3:27:06	12121	15067
v1.19	OMCompiler v1.19.2-v1.19.2.2+g9baf633d57	2023-02-04 11:47:26	2 days, 23:53:41	13104	15055
v1.20	OMCompiler v1.20.0-v1.20.0.1+g2faf7aa0ea	2023-02-04 12:31:41	2 days, 17:33:18	13088	15055
master	OMCompiler v1.21.0-dev.233+geac10d9a03	2023-02-06 03:22:38	2 days, 17:56:59	13151	15067

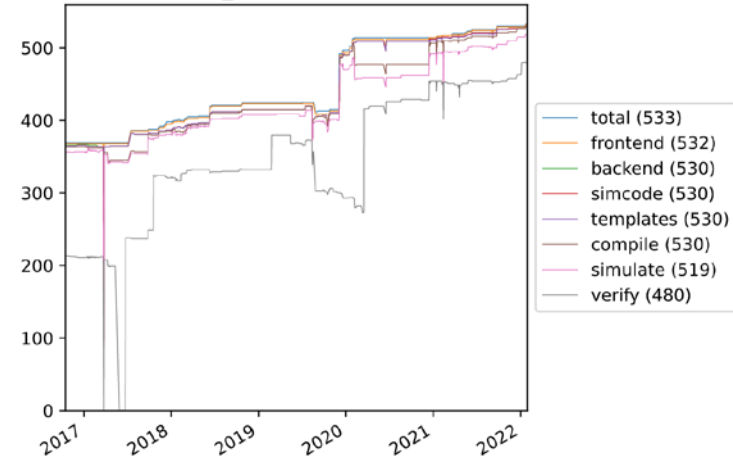
OpenModelica Testing (II)

- 2023-02-06 v1.21.0-dev - total 534 - build 533 (99.81%) - sim 522 (97.72%)
- Up 1% since last year

Modelica_trunk (master branch)



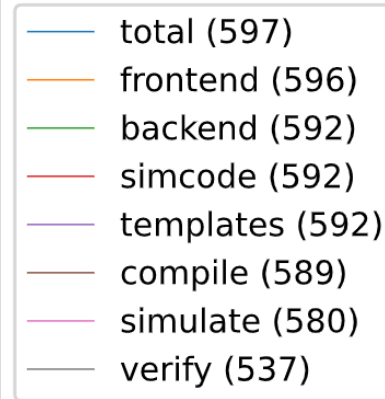
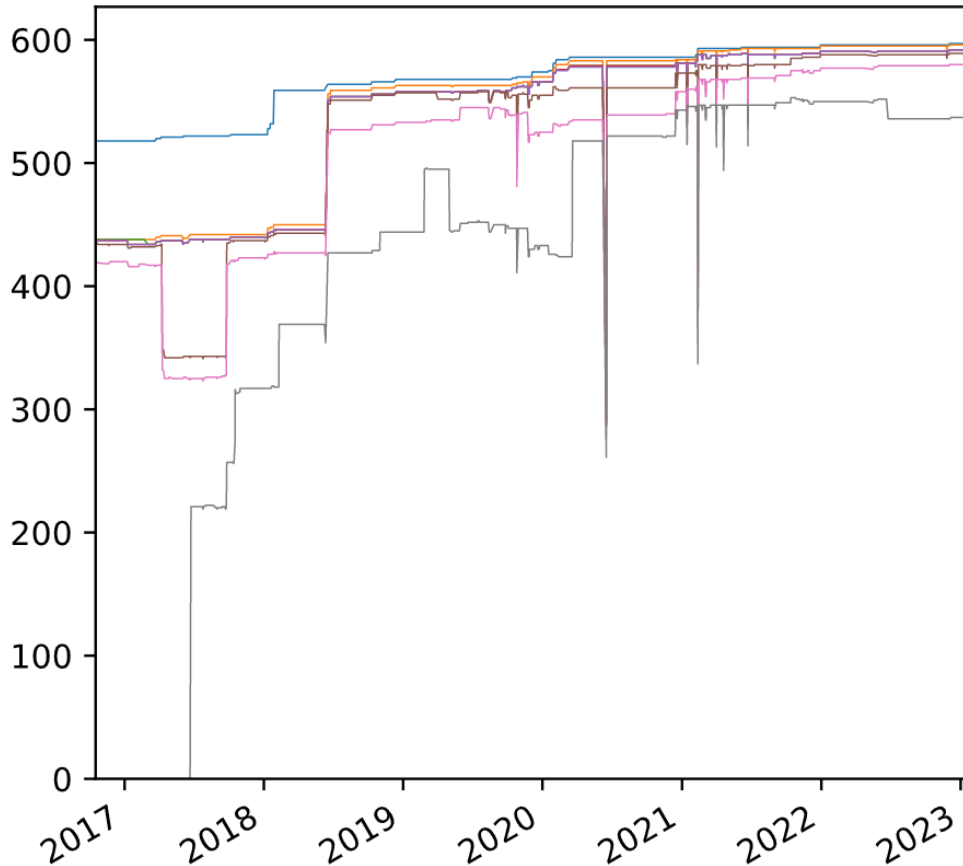
Modelica_trunk (master branch)



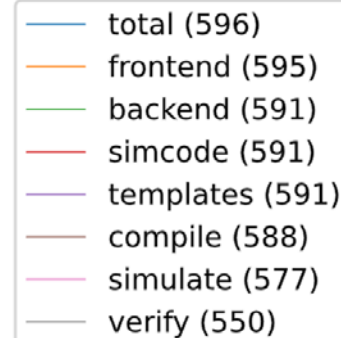
OpenModelica Testing (III)

- 2023-02-06 v1.21.0-dev - total 597 - build 589 (99%) - sim 580 (97.15%)
- Up ~1% since last year

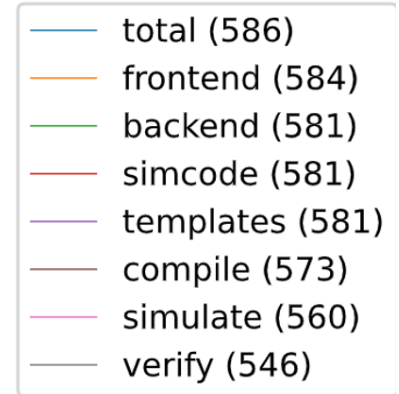
ModelicaTest_trunk (master branch)



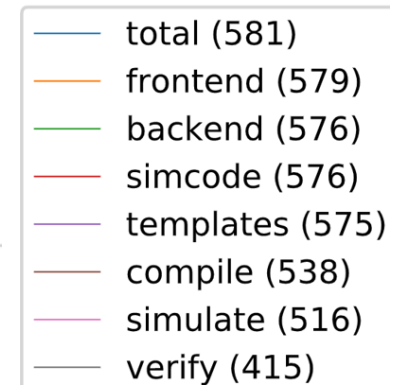
2022



2021



2020



OpenModelica Statistics (I)

- Moved the source code to github May 2015
- Mature code base: <https://github.com/OpenModelica>
- ~9000K+ lines of code and tests

- From Feb 2017 - Feb 2018
 - 20 contributors
 - 794 commits (OMCompiler)

- From Feb 2018 - Feb 2019
 - 30+ contributors
 - 800 commits (OMCompiler)
 - 969 commits (OMSimulator)
 - 213 commits (OMEdit)

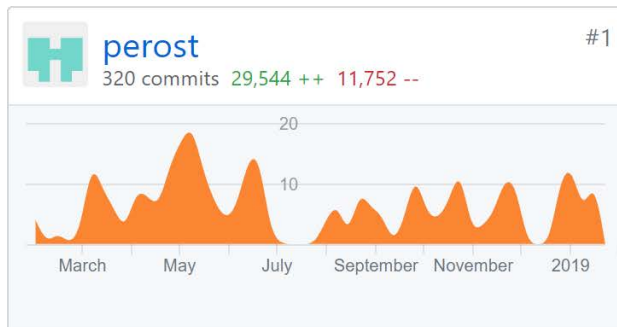
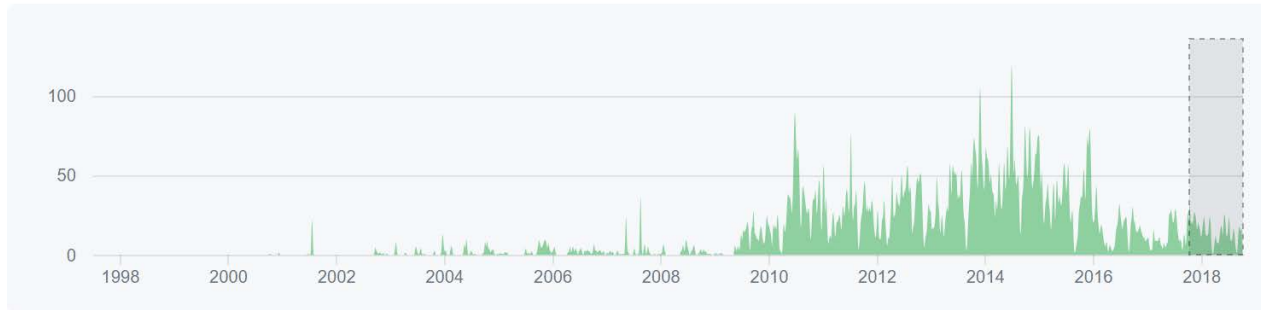
- From Feb 2019 - Feb 2020
 - 30+ contributors
 - 800 commits (OMCompiler)
 - 459 commits (OMSimulator)
 - 213 commits (OMEdit)

OpenModelica Statistics (II)

Feb 5, 2018 – Feb 3, 2019

Contributions: Commits ▾

Contributions to master, excluding merge commits

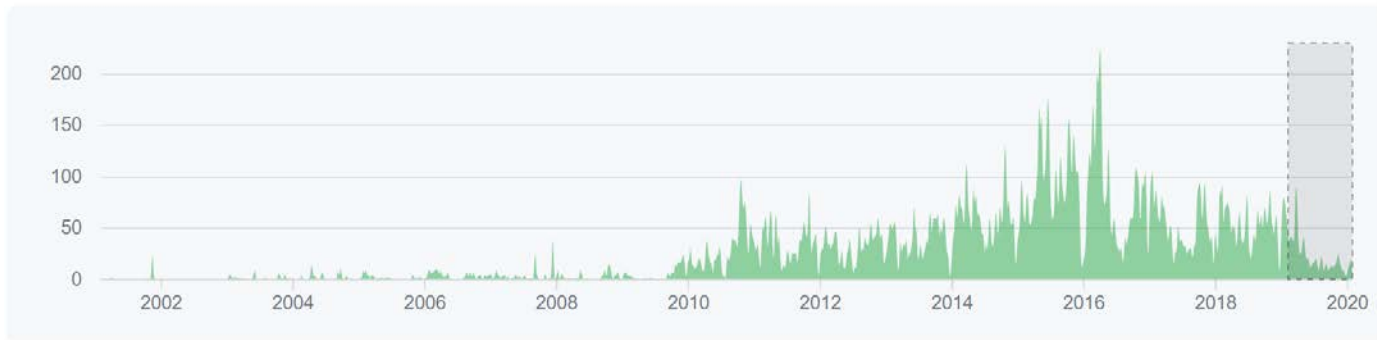


OpenModelica Statistics (III)

Feb 12, 2019 – Feb 3, 2020

Contributions: Commits ▾

Contributions to master, excluding merge commits

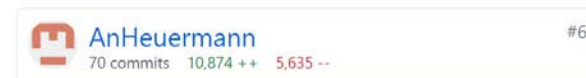
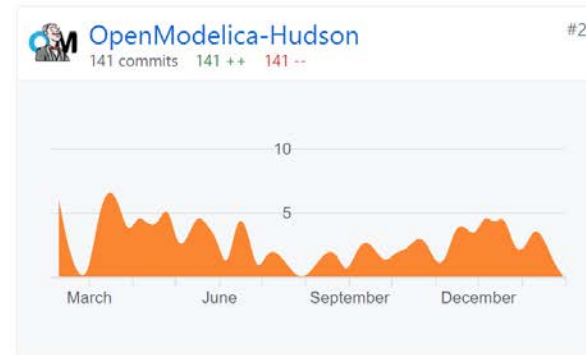
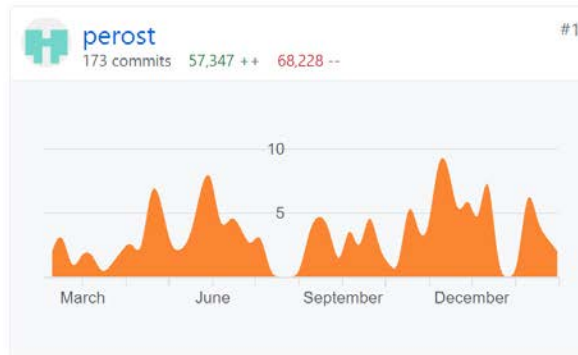
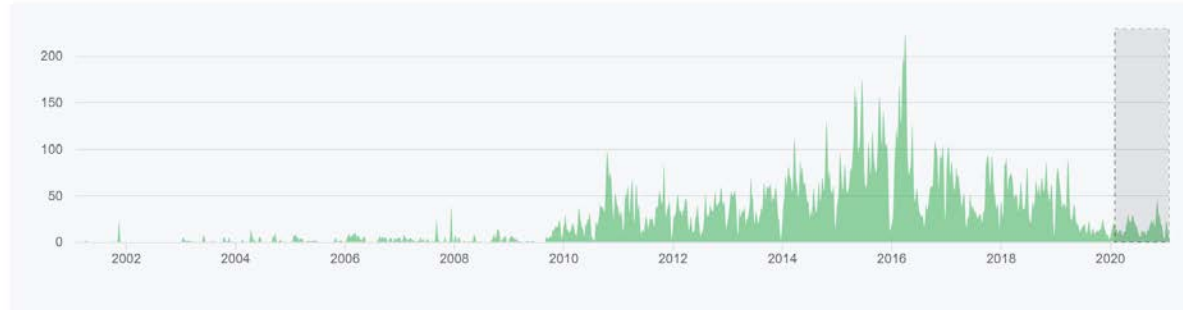


OpenModelica Statistics (IV)

Feb 3, 2020 – Feb 1, 2021

Contributions: Commits ▾

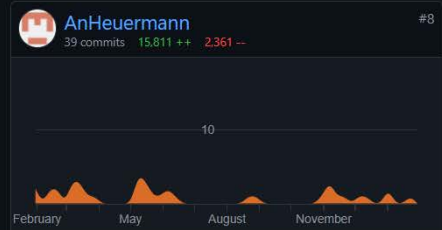
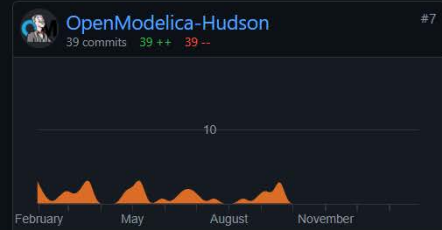
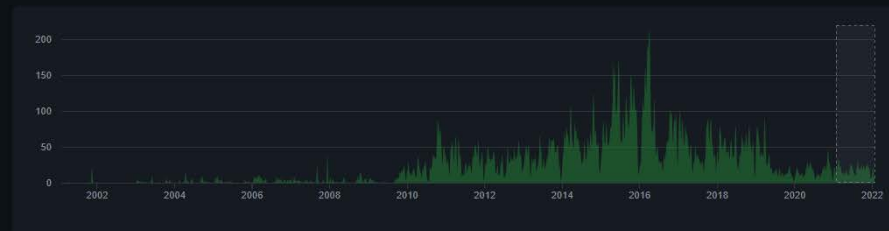
Contributions to master, excluding merge commits



Jan 31, 2021 – Jan 30, 2022

Contributions: Commits

Contributions to master, excluding merge commits and bot accounts

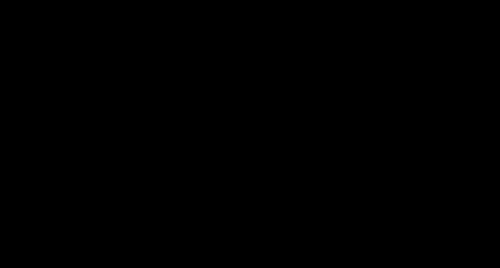
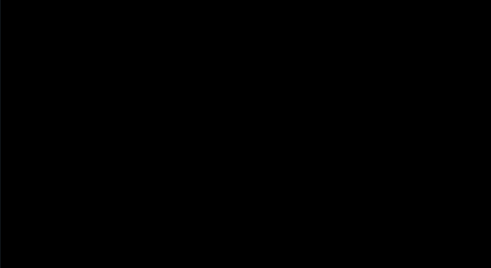


OM Statistics (V)

Jan 31, 2021 – Jan 30, 2022

Contributions: Commits

Contributions to master, excluding merge commits and bot accounts



Contributions to master, excluding merge commits and bot accounts

Contributions to master, excluding merge commits and bot accounts

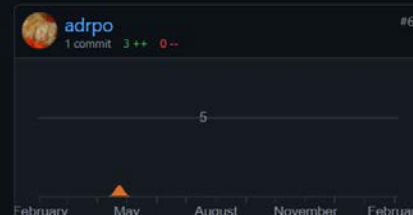
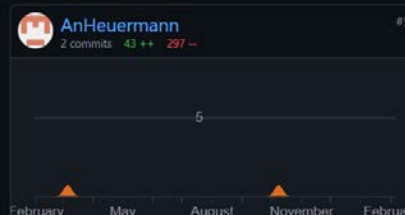
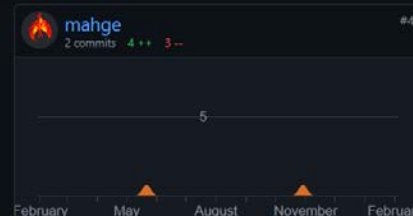
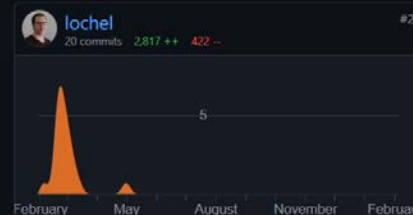


OM Statistics (VI)

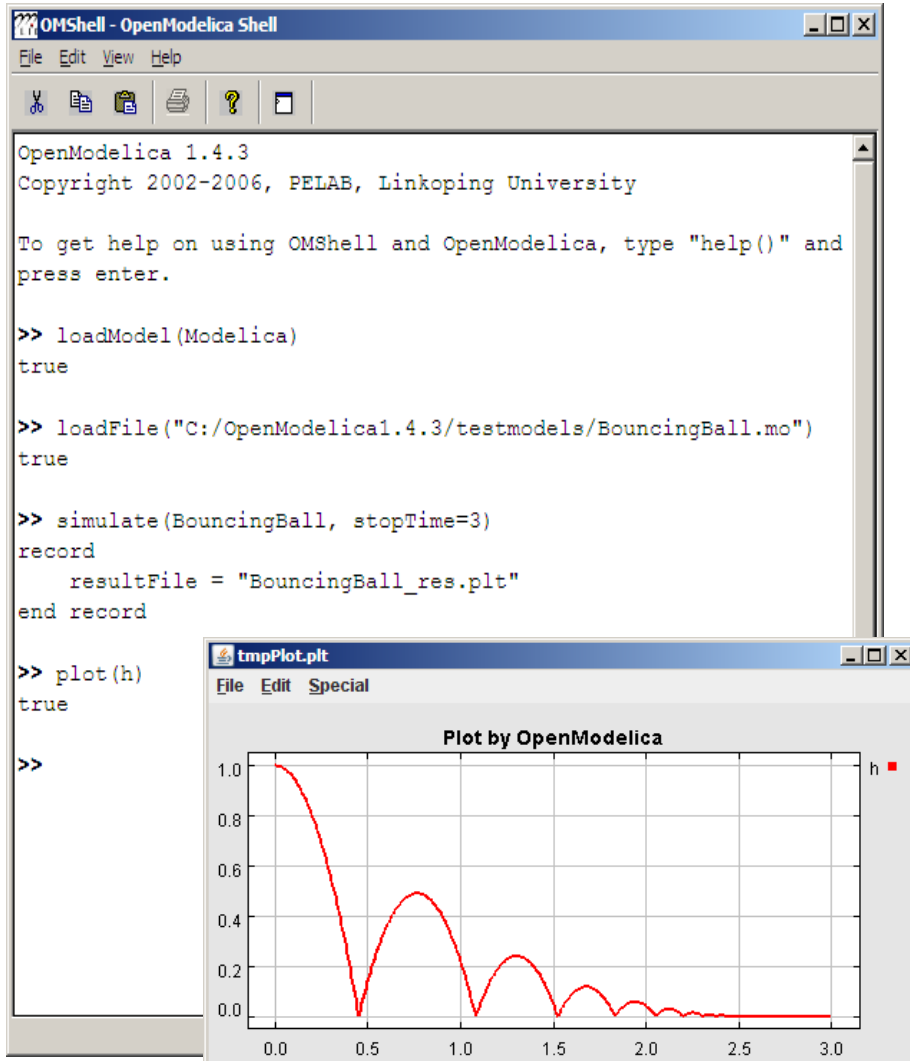
Jan 30, 2022 – Feb 6, 2023

Contributions: Commits

Contributions to master, excluding merge commits and bot accounts



- OpenModelica
 - What is OpenModelica?
 - The past
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook, OMEdit, ModelicaML, OMSimulator, OMPython, OMJulia, OMMatlab
- OpenModelica Development Environment
 - MetaModelica
 - The Eclipse Environment (MDT)
- OpenModelica Latest Developments (2021-2022)



OMShell - OpenModelica Shell

File Edit View Help

OpenModelica 1.4.3
Copyright 2002-2006, PELAB, Linköping University

To get help on using OMShell and OpenModelica, type "help()" and press enter.

```
>> loadModel(Modelica)
true

>> loadFile("C:/OpenModelica1.4.3/testmodels/BouncingBall.mo")
true

>> simulate(BouncingBall, stopTime=3)
record
  resultFile = "BouncingBall_res.plt"
end record

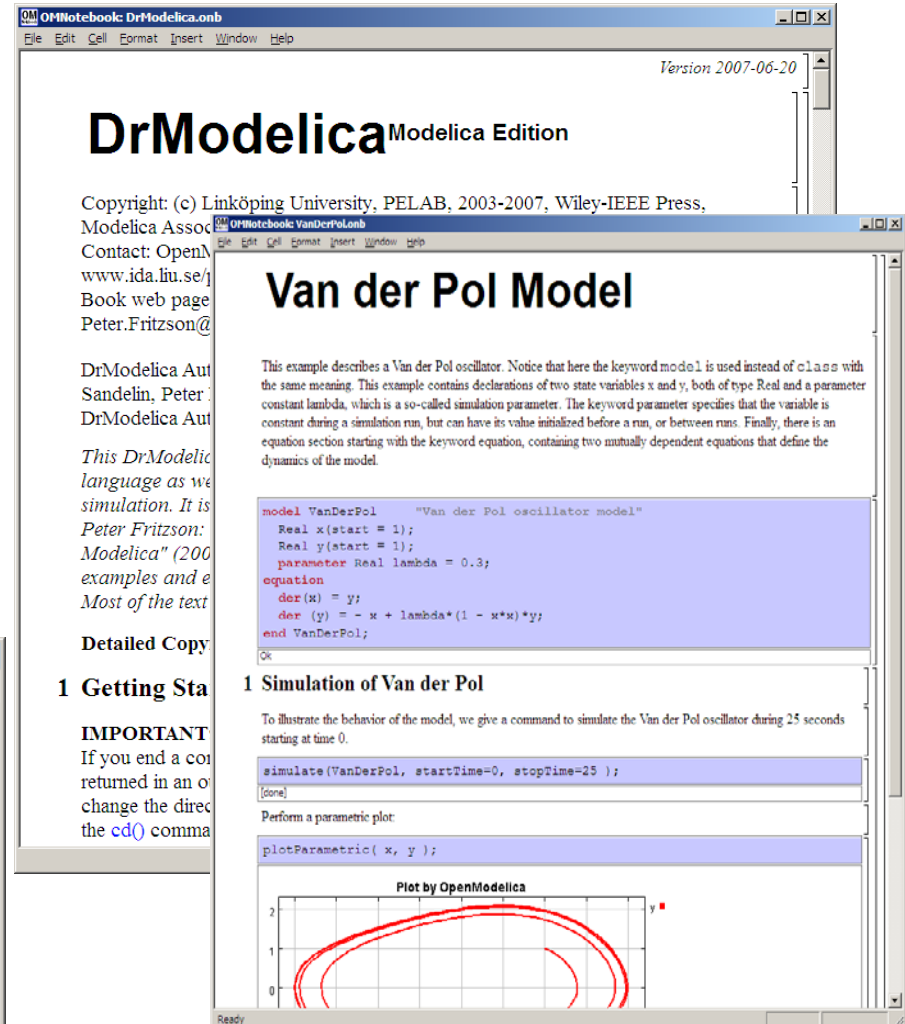
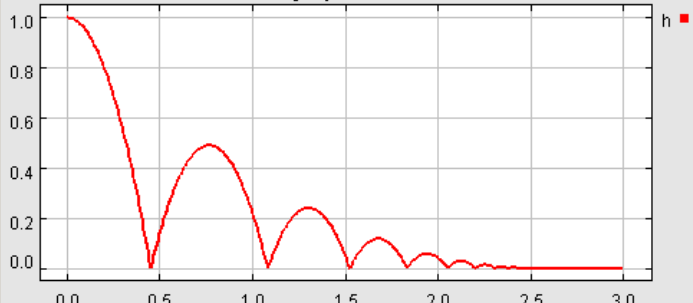
>> plot(h)
true

>>
```

tmpPlot.plt

File Edit Special

Plot by OpenModelica



OMNotebook: DrModelica.onb

File Edit Cell Format Insert Window Help

Version 2007-06-20

DrModelica Modelica Edition

Copyright: (c) Linköping University, PELAB, 2003-2007, Wiley-IEEE Press,
Modelica Association, Peter Fritzson

Contact: OpenModelica
www.ida.liu.se/~ida
Book web page
Peter.Fritzson@ida.liu.se

Van der Pol Model

This example describes a Van der Pol oscillator. Notice that here the keyword `model` is used instead of `class` with the same meaning. This example contains declarations of two state variables `x` and `y`, both of type `Real` and a parameter constant `lambda`, which is a so-called simulation parameter. The keyword parameter specifies that the variable is constant during a simulation run, but can have its value initialized before a run, or between runs. Finally, there is an equation section starting with the keyword `equation`, containing two mutually dependent equations that define the dynamics of the model.

```
model VanDerPol "Van der Pol oscillator model"
  Real x(start = 1);
  Real y(start = 1);
  parameter Real lambda = 0.3;
equation
  der(x) = y;
  der(y) = -x + lambda*(1 - x*x)*y;
end VanDerPol;
```

Ok

1 Simulation of Van der Pol


To illustrate the behavior of the model, we give a command to simulate the Van der Pol oscillator during 25 seconds starting at time 0.

```
simulate(VanDerPol, startTime=0, stopTime=25);
```

[done]

Perform a parametric plot:

```
plotParametric(x, y);
```



OMEdit- OpenModelica Connection Editor

The screenshot displays the OMEdit - OpenModelica Connection Editor window. The title bar shows the application name and standard window controls. The menu bar includes File, Edit, View, Simulation, FMI, Export, Debug, QMSimulator, Git, Tools, and Help. The Libraries Browser on the left lists various libraries, with 'Elementary' > 'DoublePendulum' selected. The main workspace shows a mechanical system diagram with a 'world' frame, a 'damper' block (d=0.1), and two 'boxBody' blocks (boxBody1 and boxBody2) connected by joints. The diagram includes coordinate axes (x, y) and joint parameters like $n=\{0, 0, 1\}$ and $r=\{0.5, 0, 0\}$. The Messages Browser at the bottom is currently empty.

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

- OpenModelica
 - What is OpenModelica?
 - The past and present
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook, OMEdit, ModelicaML, OMSimulator, OMPython, OMJulia, OMMatlab
- OpenModelica Development Environment
 - MetaModelica
 - The Eclipse Environment
- OpenModelica Latest Developments (2019-2020)

- **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)

Modelica - Eclipse SDK

File Edit Refactor Navigate Search Project Run Window Help

New Alt+Shift+N ▶ Project...

Open File... Ctrl+F4

Close Ctrl+Shift+F4

Save Ctrl+S

Save As... Ctrl+Shift+S

Save All

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.

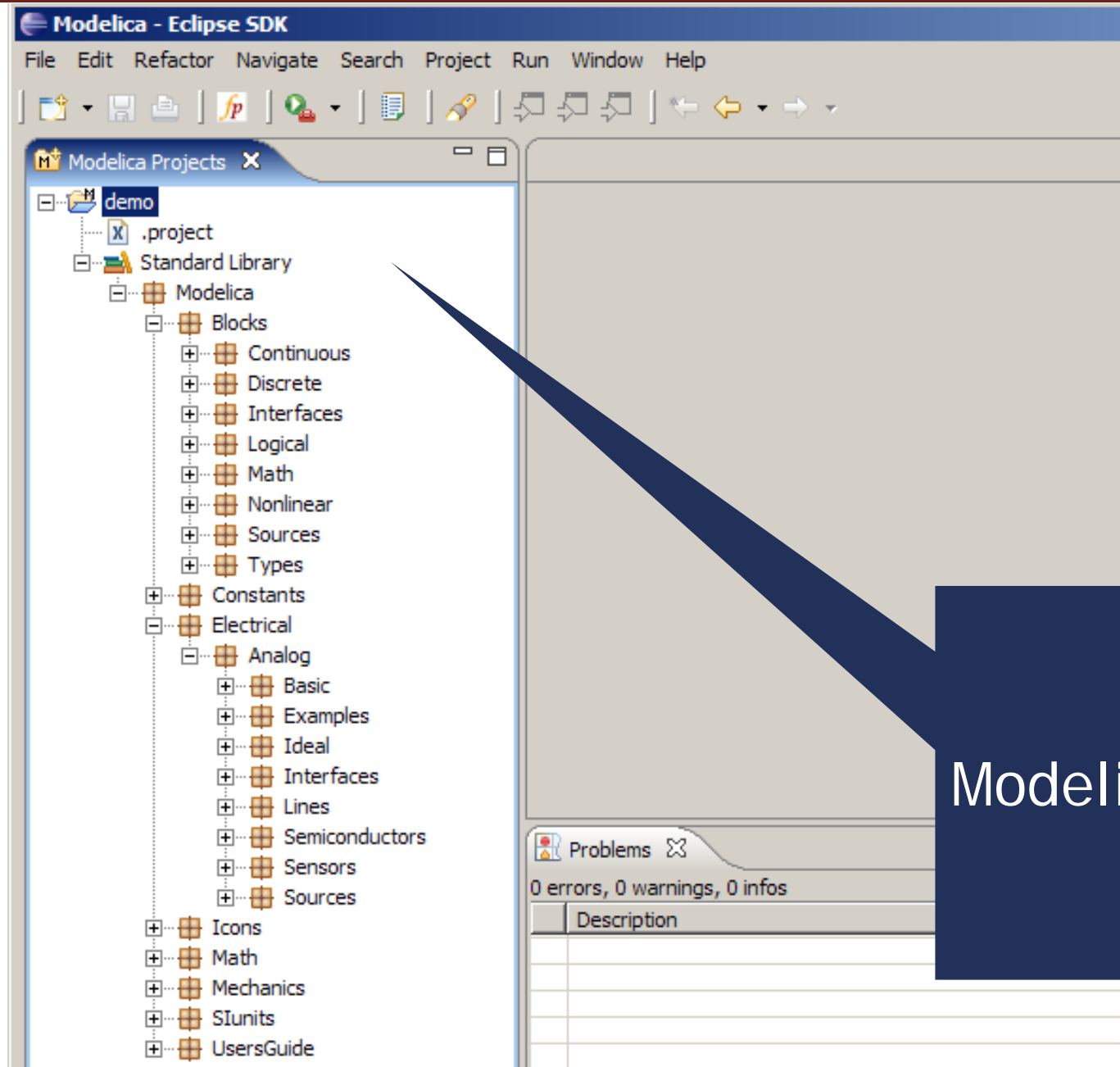
Project name: demo

< Back Next >

< Back Next > Finish Cancel

Creation of Modelica projects using wizards

Creating Modelica projects (II)



Modelica project

Creating Modelica packages

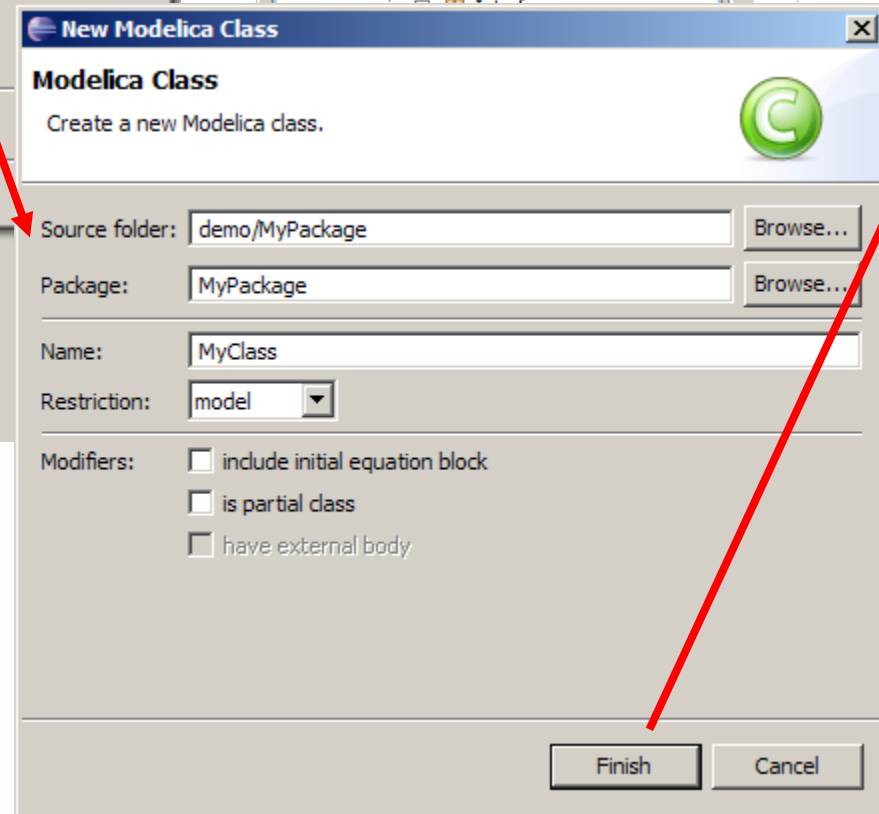
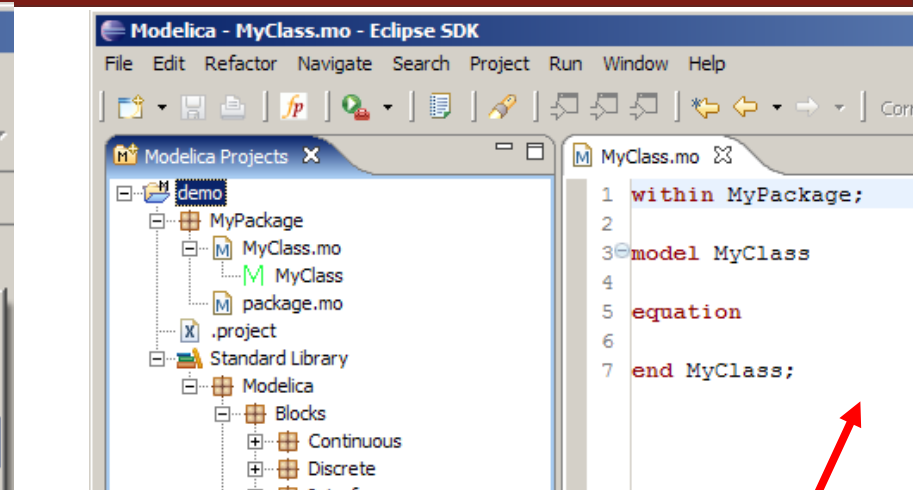
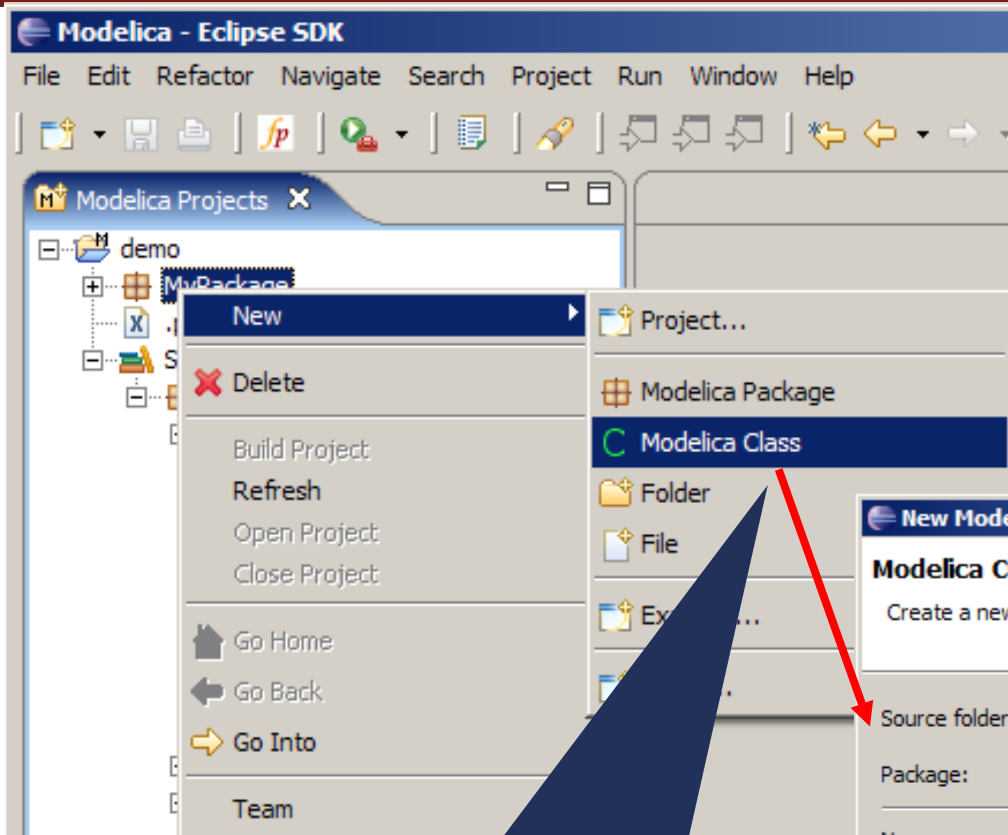
The image shows the Eclipse IDE interface for creating a new Modelica package. The 'New' menu is open, and the 'Modelica Package' option is selected. The 'New Modelica Package' wizard dialog is displayed, with the following fields and options:

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

The 'Finish' button is highlighted with a red arrow, indicating the next step in the process.

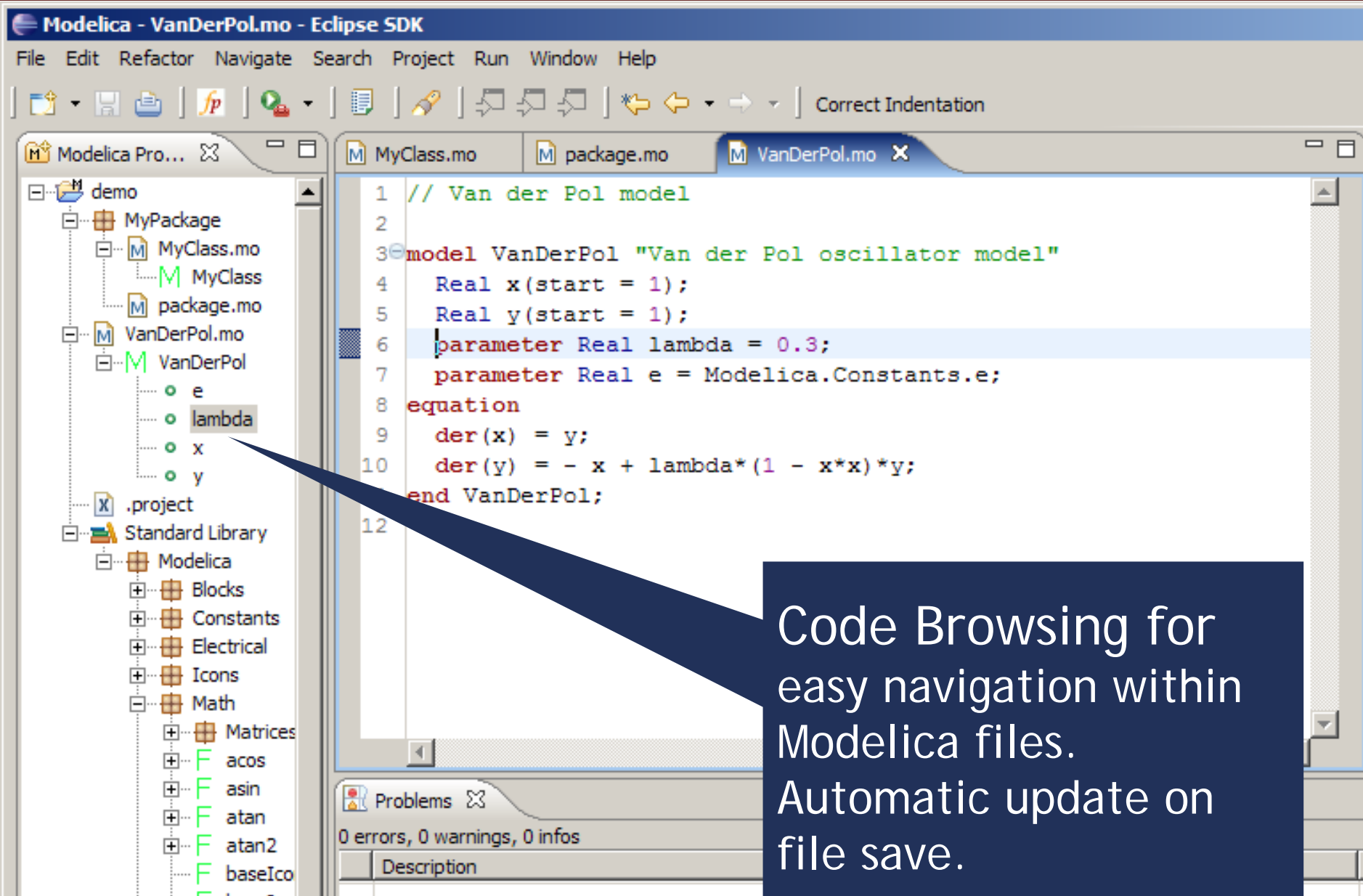
Creation of Modelica packages using wizards

Creating Modelica classes



Creation of Modelica classes, models, etc, using wizards

Code browsing



The screenshot displays the Eclipse IDE interface for a Modelica project. The left-hand side shows a project tree with the following structure:

- demo
 - MyPackage
 - MyClass.mo
 - MyClass
 - package.mo
 - VanDerPol.mo
 - VanDerPol
 - e
 - lambda
 - x
 - y
 - .project
 - Standard Library
 - Modelica
 - Blocks
 - Constants
 - Electrical
 - Icons
 - Math
 - Matrices
 - acos
 - asin
 - atan
 - atan2
 - baseIco

The main editor window shows the code for `VanDerPol.mo` with the following content:

```
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   parameter 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
```

The line `parameter Real lambda = 0.3;` is highlighted in blue. A callout box points to the `lambda` variable in the project tree and the code editor, containing the text:

Code Browsing for easy navigation within Modelica files. Automatic update on file save.

The bottom status bar shows "0 errors, 0 warnings, 0 infos" and a "Description" tab.

Error detection (I)

The screenshot shows the Eclipse IDE with the following components:

- Project Explorer:** Shows a project named 'demo' containing a package 'MyPackage' with files 'MyClass.mo', 'package.mo', and 'VanDerPol.mo'. The 'VanDerPol' component is expanded, showing parameters 'e', 'x', and 'y'.
- Code Editor:** Displays the content of 'VanDerPol.mo'. The code is as follows:

```
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   parameter 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
```

Line 6 is highlighted in blue, and a red 'X' icon is visible in the left margin next to it.
- Problems Window:** 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 following components:

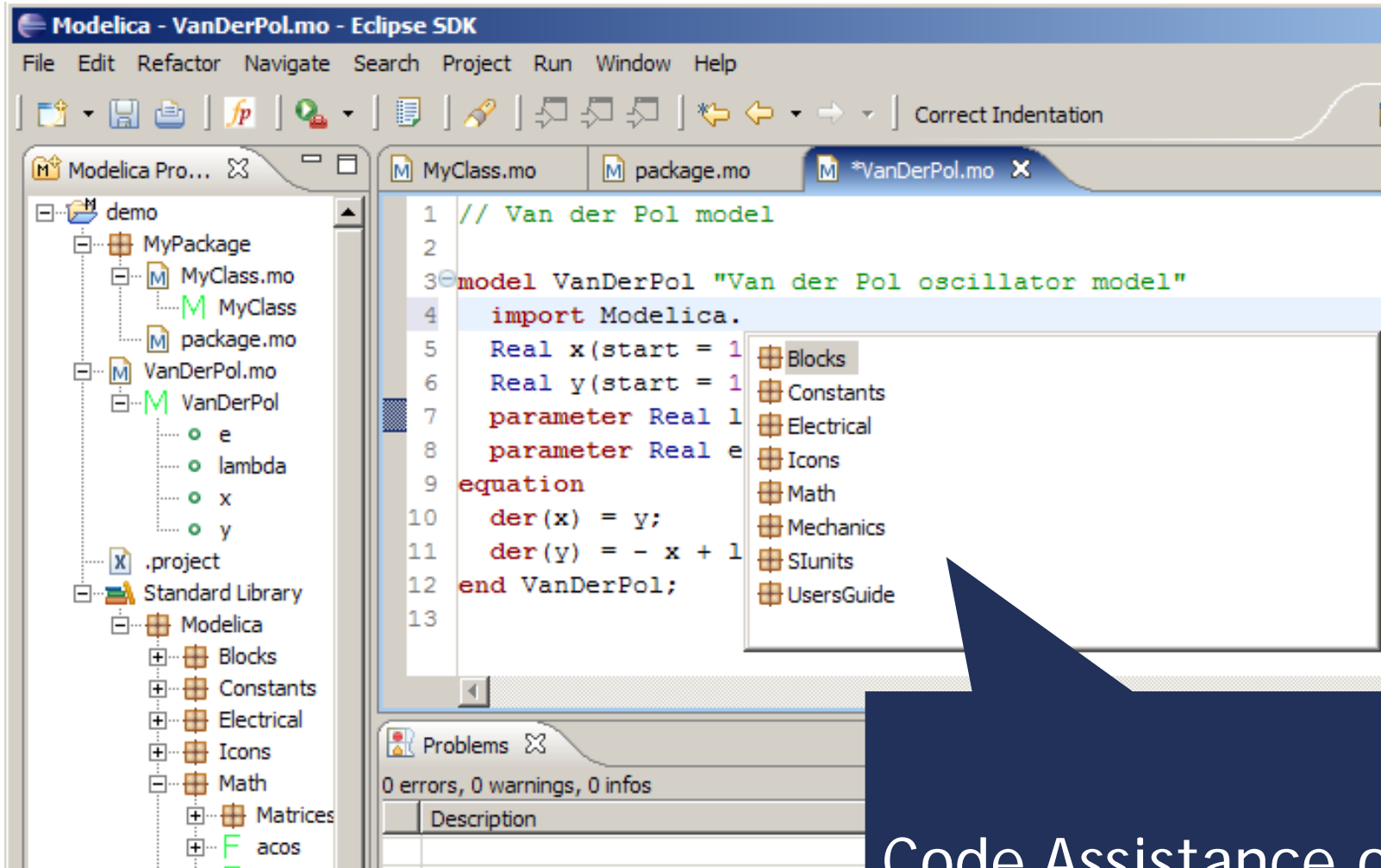
- Modelica Projects:** A tree view on the left showing a project structure with folders like 'Compiler', 'absyn_builder', 'doc', 'modpar', 'omc_debug', 'omc_release', 'report', 'rml2mmo', 'rml2sig', 'runtime', 'scripts', 'test_codegen', 'tools', 'VC7', 'winruntime', and files like 'Absyn.mo', 'Algorithm.mo', 'Builtin.mo', 'Ceval.mo', 'ClassLoader.mo', 'Codegen.mo', 'Connect.mo', 'Corba.mo', 'DAE.mo', 'DAEEXT.mo', 'DAELow.mo', 'Debug.mo', and 'Derive.mo'.
- Absyn.mo Editor:** The main editor window shows 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;
79
```
- Problems/Console:** The bottom panel shows the error log with the following text:

```
<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.../home
make[2]: *** [Absyn.h] Error 1
make[1]: *** [omc_release] Error 2
make: *** [omc] Error 2
```

Semantic error
detection on
compilation

Code assistance (I)



The screenshot shows the Eclipse IDE interface with the following components:

- Project Explorer (Left):** Shows a project named 'demo' containing a package 'MyPackage' with files 'MyClass.mo', 'package.mo', and 'VanDerPol.mo'. The 'VanDerPol.mo' file is expanded to show a class 'VanDerPol' with parameters 'e', 'lambda', 'x', and 'y'. Below it is a 'Standard Library' containing 'Modelica' with sub-packages like 'Blocks', 'Constants', 'Electrical', 'Icons', 'Math', 'Matrices', and 'acos'.
- Editor (Center):** Displays the code for 'VanDerPol.mo'. The code is:

```
1 // Van der Pol model
2
3 model VanDerPol "Van der Pol oscillator model"
4   import Modelica.
5   Real x(start = 1
6   Real y(start = 1
7   parameter Real l
8   parameter Real e
9   equation
10  der(x) = y;
11  der(y) = - x + 1
12 end VanDerPol;
13
```

Line 4 is highlighted, and a code assistance popup is visible.
- Code Assistance Popup (Right):** A list of packages from the 'Standard Library' is shown, including 'Blocks', 'Constants', 'Electrical', 'Icons', 'Math', 'Mechanics', 'SIunits', and 'UsersGuide'.
- Problems View (Bottom):** Shows '0 errors, 0 warnings, 0 infos'.

Code Assistance on imports

Code assistance (II)

The screenshot shows the Eclipse IDE with the following components:

- Project Explorer:** Shows a project named 'demo' with a package 'MyPackage' containing 'MyClass.mo', 'MyClass', and 'package.mo'. A 'VanDerPol.mo' file is also present, containing a 'VanDerPol' model with parameters 'e', 'lambda', 'x', and 'y'.
- Editor:** Displays the code for 'VanDerPol.mo'. The current line is: `parameter Real e = Modelica.Constants.` The IDE has provided a list of suggestions for the variable 'e'.
- Problems View:** Shows '0 errors, 0 warnings, 0 infos'.
- Table:** A table with columns 'Description', 'Resource', 'In Folder', and 'Location' is visible at the bottom.

```
1 // Van der Pol model
2
3 model VanDerPol "Van der Pol oscillator model"
4   import Modelica.Math;
5   Real x(start = 1);
6   Real y(start = 1);
7   parameter Real lambda = 0.3;
8   parameter Real e = Modelica.Constants.
9 equation
10  der(x) = y;
11  der(y) = - x + lambda*(1 - x*x)*y;
12 end VanDerPol;
13
```

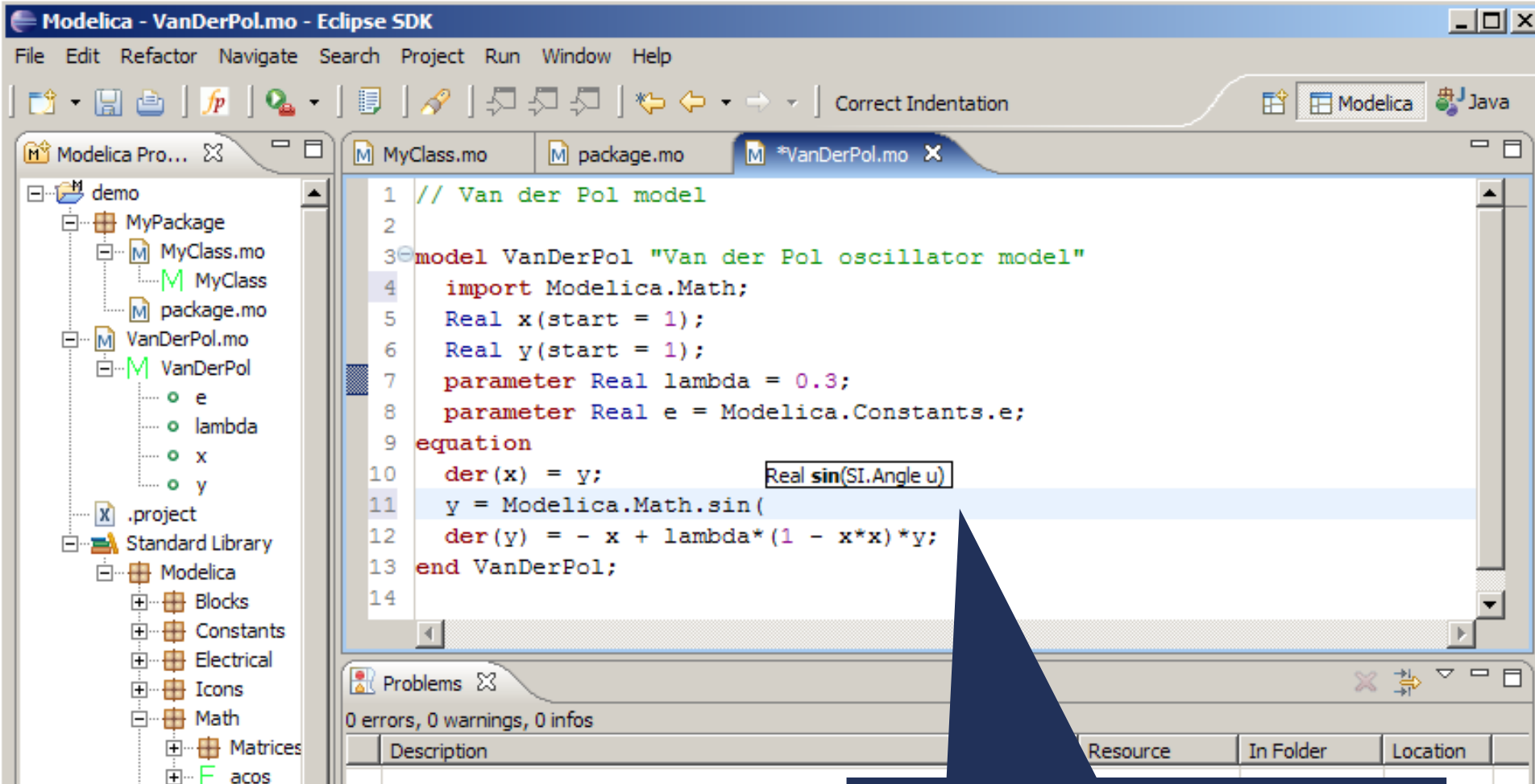
Suggestions for 'e':

- c
- D2R
- e
- eps
- epsilon_0
- G
- g_n
- h
- inf

Description	Resource	In Folder	Location

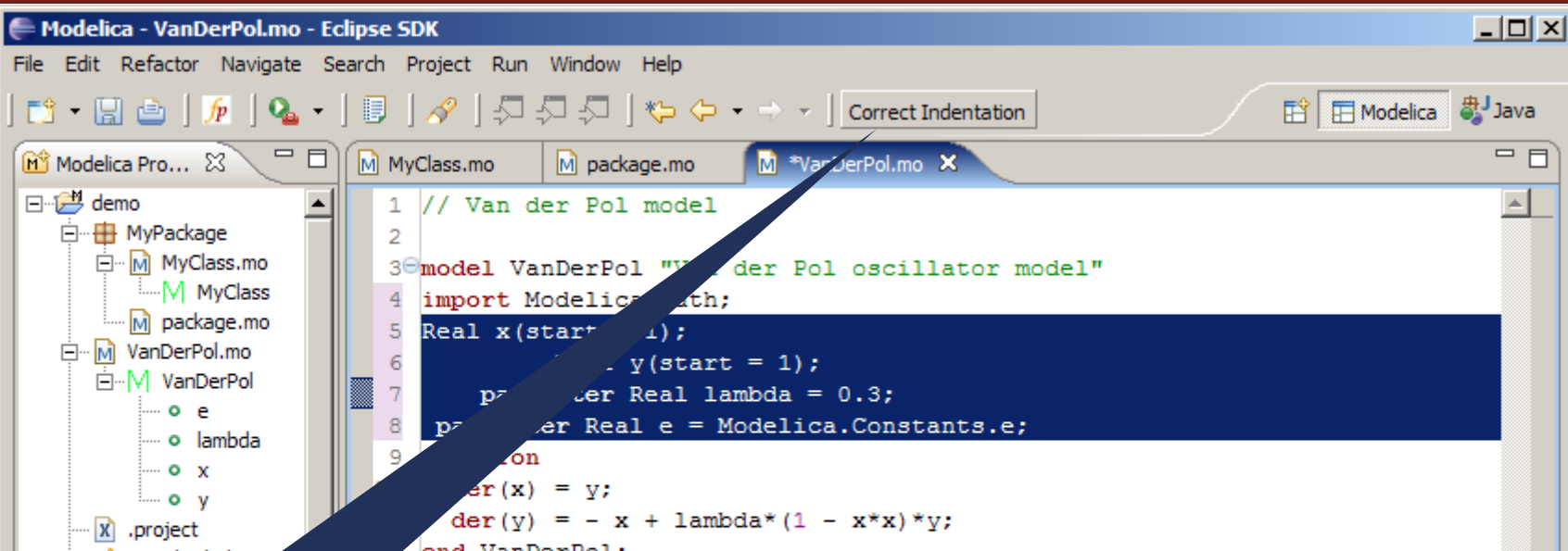
Code Assistance on assignments

Code assistance (III)



Code Assistance on
function calls

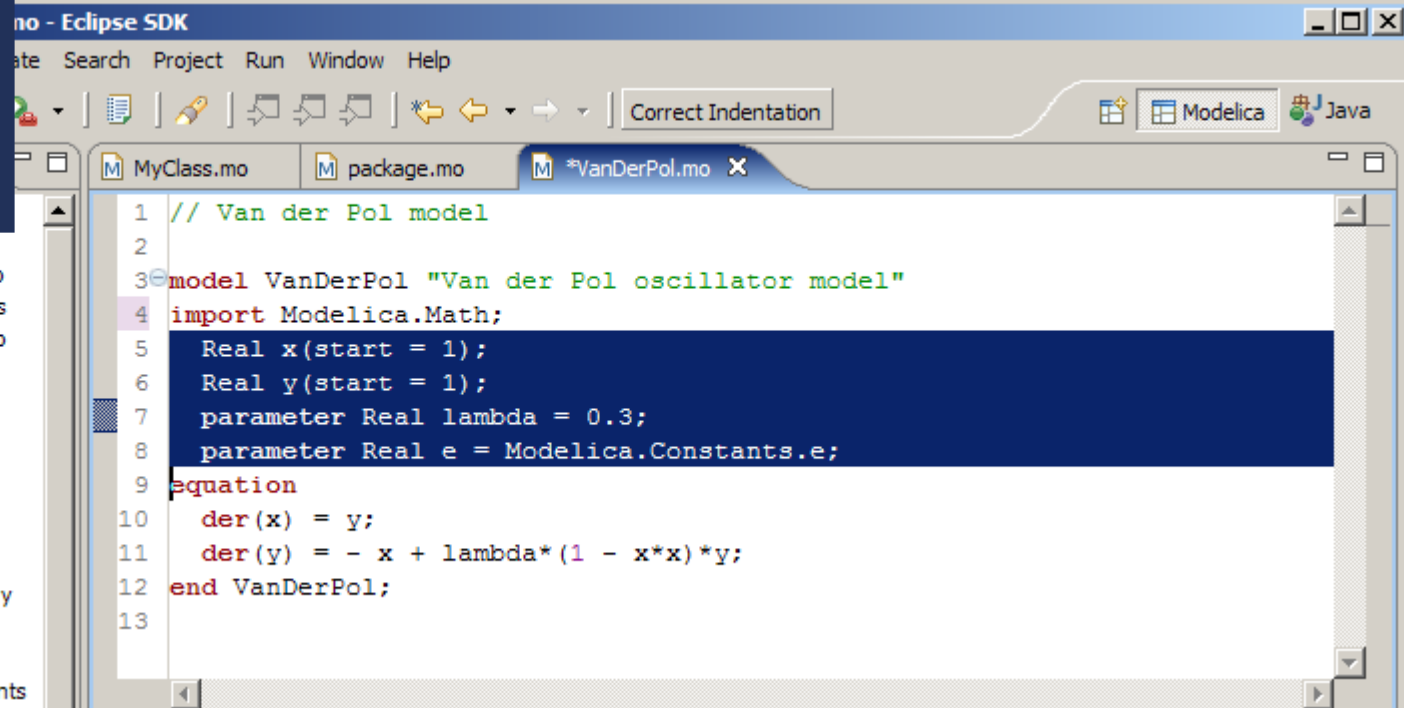
Code indentation



The screenshot shows the Eclipse IDE with the 'Correct Indentation' button highlighted in the toolbar. A blue arrow points from the button to the code in the editor. The code is as follows:

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

Code
Indentation



The screenshot shows the Eclipse IDE with the 'Correct Indentation' button highlighted in the toolbar. The code in the editor is now indented as follows:

```
1 // Van der Pol model
2
3 model VanDerPol "Van der Pol oscillator model"
4 import Modelica.Math;
5   Real x(start = 1);
6   Real y(start = 1);
7   parameter Real lambda = 0.3;
8   parameter Real e = Modelica.Constants.e;
9 equation
10   der(x) = y;
11   der(y) = - x + lambda*(1 - x*x)*y;
12 end VanDerPol;
13
```


Code Outline and Hovering Info

The screenshot displays the Eclipse IDE with the following components:

- Project Explorer:** Shows a tree view of Modelica projects including `rml2sig`, `runtime`, `scripts`, `test_codegen`, `tools`, `VC7`, and `Absyn.mo`.
- Code Editor:** Displays the source code for `Absyn.mo`. A tooltip is shown over the function `getCrefFromExp`, providing its signature and description: "function getCrefFromExp 'function: getCrefFromExp Returns a flattened list of the component references in an expression'".
- Outline:** Provides a hierarchical view of the code structure for `Absyn`, listing various algorithm items like `ADD`, `ALG_ASSIGN`, `ALG_BREAK`, etc.
- Problems:** Shows a list of errors, with the first one being "The identifier at start and end are different".

Code Outline for easy navigation within Modelica files

Identifier Info on Hovering

64M of 254M | Ctrl Contrib (Bottom)

Eclipse Debugging Environment

The screenshot displays the Eclipse IDE with the following components:

- Breakpoints**: Shows no active breakpoints.
- Variables**: A table showing the state of variables during a debug session.
- Console**: Shows the output of the program, including a 'Parsed program' message.
- Outline**: Shows the project structure and the current file being edited.
- Code Editor**: Shows the source code of the 'Bla.mo' file, with a breakpoint set at the 'translateFile' function call.

Name	Value	Declared Type
p	Absyn.Program	Absyn.Program
[record]	Absyn.PROGRAM[2]	((Absyn.Class list, Absyn.Within) :
classes	LIST	Absyn.Class list
[0]	Absyn.CLASS[7]	((string, bool, bool, bool, Absyn.R
name	"Bla"	string
partial_	false	bool
final_	false	bool
encapsulated_	false	bool
restriction	1:enum:Absyn.R_MODEL	Absyn.Restriction
body	Absyn.PARTS[2]	((Absyn.ClassPart list, string optio
classParts	LIST	Absyn.ClassPart list
[0]	Absyn.PUBLIC[1]	((Absyn.ElementItem list) => (Abs
contents	LIST	Absyn.ElementItem list
[0]	Absyn.ELEMENTITEM[1]	((Absyn.Element) => (Absyn.Elen
comment	NONE[0]	string option
info	Absyn.INFO[6]	((string, bool, int, int, int, int) =>
within_	Absyn.TOP[0]	Absyn.Within
f	string	string
->	"Bla.mo"	string

- 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 title is "OMEdit - Transformational Debugger" and the file path is "C:/Users/adeas31/AppData/Local/Temp/OpenModelica/OMEdit/Debugging.SolverFailure.NonlinearSolverSimulation_info.xml".

Variables Panel: This panel is divided into "Variables Browser" and "Defined In Equations". The "Variables Browser" includes a search field, a "Case Sensitive" checkbox, a "Regular Expression" dropdown, and "Expand All" and "Collapse All" buttons. Below this is a table of variables:

Variables	Comment	Line	Location
A	Storage ... section	120	C:\User
Kv	Valve coefficient	112	C:\User
T0	Tempera...g fluid	118	C:\User
T1	Pump di...erature	138	C:\User
Tref	Referen...utation	124	C:\User

The "Defined In Equations" table shows:

Index	Type	Equation
1	initial	(assignment) ...*(T0 - Tref)
28	parameter	(assignment) ...*(T0 - Tref)

Equations Panel: This panel is divided into "Equations Browser", "Defines", and "Depends". The "Equations Browser" table lists equations:

Index	Type	Equation
1	initial	(assignment) ...*(T0 - Tref)
2	initial	(assignment)...o * y + patm
3	initial	(assignment)..._pump ^ 2.0
4	initial	(assignmen...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	(assignmen...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 "Defines" table shows:

Variable
h0

The "Depends" table shows:

Variable
cp
T0
Tref

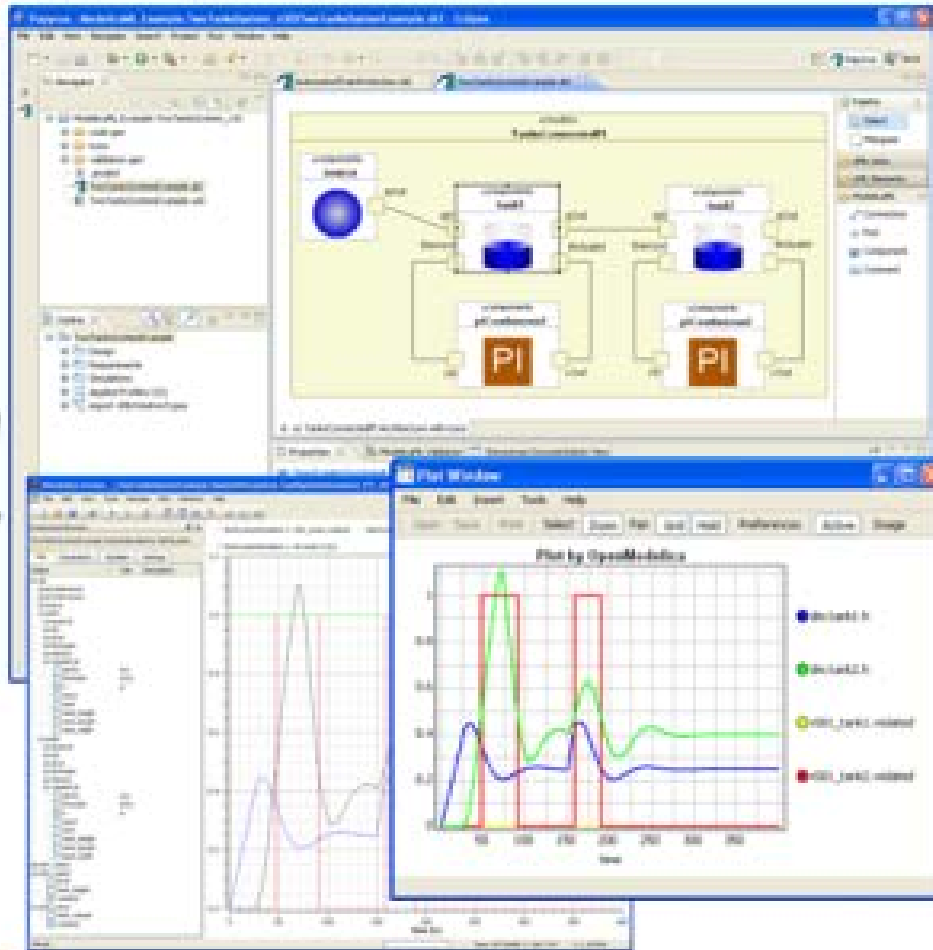
Source Browser: This panel shows the source code for "C:/Users/adeas31/Desktop/Debugging.mo". The code includes parameter declarations and equations for enthalpy computation, pump discharge pressure, and reservoir level.

```
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 2022!

Eclipse environment for ModelicaML

① System Modeling with ModelicaML



② Modelica Code Generation

```
ModelicaML
function generateCode
  input Real p[2];
  input Real d[2];
  input Real u;
  input Real y;

  // ... (omitted code) ...

  // ... (omitted code) ...

end generateCode;

// ... (omitted code) ...

end ModelicaML;
```

③ System Simulation with Modelica Tools

- OpenModelica
 - What is OpenModelica?
 - The past
- OpenModelica Technical Overview
 - OMC, OMShell, OMNotebook, OMEdit, ModelicaML, OMSimulator, OMPython, OMJulia, OMMatlab
- OpenModelica Development Environment
 - MetaModelica
 - The Eclipse Environment (MDT)
- OpenModelica Latest Developments (2022-2023)

Latest Developments (2022-2023) (I)

- 2022 - 2023 - focus on coverage, GUI, Package Manager
- OMC & Clients & OMSimulator
 - Performance & scalability improvements
 - Bug fixes and enhancements to OMC, OMEdit, FMI, Runtime, Backend, etc.
 - FMI export fixes and enhancements
 - Better coverage
<https://libraries.openmodelica.org/branches/overview.html>
 - New API in OMEdit based on the new frontend (DFD Bosch, DFD LBL)
 - New Backend improvements
 - Improved SSP support in OMSimulator and better OMEdit integration
 - New state-estimation algorithm (DFD EDF)
- General
 - From Jan 2022 - Feb 2023
 - 29+ contributors
 - 909 commits (OpenModelica/OMCompiler/OMEdit)
 - 54 commits (OMSimulator)
 - Releases 1.19.x, 1.20.x

Latest Developments (2022-2023) (II)

- OMC / OMEdit - new API for instance hierarchy editing
 - Faster model display and graphical editing
 - Use the new front-end to instantiate the Model (once!)
 - Give the instance tree (including typed annotations) to OMEdit
 - Using a JSON serialization
 - Allow OMEdit to edit the instance tree
 - Propagate the instance tree edits to the top level class
 - Build a simulation from the changed instance tree
 - Finally the work on this (P & A) has been started and we will be able to solve 6+ yrs old issues
- Julia instead of MetaModelica?
 - OpenModelica front-end translated to Julia
 - Back-end in Julia, support for VSS has now a PoC
 - Available on github:
<https://github.com/JKRT/OM.jl>

- **OMEdit in the browser**
 - Docker-based, apache2, noVNC, etc.
 - We will try to use it for one tutorial tomorrow
 - Contact us for the configuration settings

The screenshot displays the OMEdit web interface in a browser window. The main plot shows the variable 'loadTorque.phi (deg)' over a 4-second period, with values increasing from 0 to approximately 105. The interface includes a 'Libraries Browser' on the left, a 'Messages Browser' at the bottom, and a 'Variables Browser' on the right. The 'Variables Browser' shows a table of variables for the active model.

Variables	Value	Display Uni	Description
PID Controller			
driveAngle	90.0002...	deg	Referenc... to move
inertia1			
inertia2			
integrator			
kinematicPTP			
loadTorque			
der(phi)	-8.1...e-06		Angle of ...port.phi)
flange			
phi	105.271...	deg	Angle of ...port.phi)
tau	10	N.m	Accelera...nge.tau)
tau_constant	10.0	N.m	Constant ...rotation)
w	-8.1...e-06	rad/s	Angular v...der(phi))
speedSensor			
spring			
torque			

The Messages Browser shows the following output:

```

Compilation      Output
/tmp/OpenModelica_nobody/OMEdit/Modelica.Blocks.Examples.PID_Controller/PID_Controller -port=43307 -logFormat=xmlltc -
override=startTime=0,stopTime=4,stepSize=0.008,tolerance=1e-06,solver=dassl,outputFormat=mat,variableFilter=.* -fw/tmp/
OpenModelica_nobody/OMEdit/Modelica.Blocks.Examples.PID_Controller/res.mat -w -lv=LOG_STATS -inputPath=/tmp/
OpenModelica_nobody/OMEdit/Modelica.Blocks.Examples.PID_Controller -outputPath=/tmp/OpenModelica_nobody/OMEdit/
Modelica.Blocks.Examples.PID_Controller
The initialization finished successfully with 3 homotopy steps.
*** STATISTICS ***
The simulation finished successfully.
    
```


- **Web Browser Editor and OMSimulator in the cloud**
 - Started in the HUBCAP project, Collaboration with Perpetual Labs
 - TypeScript based front-end (using a tree-sitter parser)
<https://github.com/OpenModelica/OMFrontend.js>
 - OpenModelica based backend
<https://github.com/OpenModelica/OMWebService>
 - For a demo see: <https://youtu.be/hCvNjbWqaUw?list=PL3ewLNwzPhxIBF-xp6tvmJUuQov1j9ofT&t=1586>

The screenshot shows a web browser editor interface for a Modelica circuit simulation. The browser address bar shows `localhost:3000`. The left sidebar contains a 'LIVE SHARE' section with session details and participants, and a 'CONTACTS' section with recent and suggested contacts. The main area is split into a code editor and a circuit diagram.

Code Editor Content:

```

1 within Modelica.Electrical.Analog.Examples;
2 model ChuaCircuit "Chua's circuit, ns, V, A"
3 extends Modelica.Icons.Example;
4
5 Modelica.Electrical.Analog.Basic.Inductor L(L=18, i(start=0,
6   origin=(-75,38),
7   extent={{-25,-25},{25,25}},
8   rotation=270));
9 Modelica.Electrical.Analog.Basic.Resistor Ro(R=12.5e-3) annot
10  origin=(-75,-17),
11  extent={{-25,-25},{25,25}},
12  rotation=270));
13 Modelica.Electrical.Analog.Basic.Conductor G(G=0.565) annot
14  {25,88});
15 Modelica.Electrical.Analog.Basic.Capacitor C1(C=10, v(start=4
16  origin={25,3},
17  extent={{-25,-25},{25,25}},
18  rotation=270));
19 Modelica.Electrical.Analog.Basic.Capacitor C2(C=100, v(start=
20  origin={-25,3},
21  extent={{-25,-25},{25,25}},
22  rotation=270));
23 Modelica.Electrical.Analog.Examples.Utilities.NonlinearResist
24  Ga(min=-1) = -0.757576,
25  Gb(min=-1) = -0.489091,
26  Ve=1) annotation (Placement(transformation(
27  origin={75,3},
28  extent={{-25,-25},{25,25}},
29  rotation=270));
30 Modelica.Electrical.Analog.Basic.Ground Gnd annotation (Place
31  -62));
32 equation
33 connect(L.n, Ro.p) annotation (Line(points={{-75,13},{-75,8}
34 connect(C2.p, G.p) annotation (Line(
35   points={{-25,28},{-25,45.5},{-25,45.5},{-25,63}}, color={

```

Circuit Diagram:

The circuit diagram, titled "Circuit", shows a Chua circuit. It consists of an inductor L in series with a resistor R_o . This is followed by a node connected to a capacitor C_2 and a conductance G . The conductance G is connected to a node that is also connected to a capacitor C_1 and a nonlinear resistor Nr . The nonlinear resistor Nr is connected to ground. The circuit is powered by a ground connection labeled Gnd .

Thank You!

Questions?

abhinnk, achary, adeas31, adrho, afshe, alash325, alexchandel, AlexeyLebedev, Andreas, andsa, AntHeuermann, ankar, anotheruserofgithub, Ariel, arun3688, a-severin, asodja, atosinenko, azazi, bernhardbachmann, bernhard-thiele, bjozac, casella, choeger, chrjo5, crupp2, davbr, david-polak, dhedberg, dietmarw, Dongliang Li, donida, edgarlopez, ericmeyers, farkasrebus, fbergero, florosx, frape315, Frenkel TUD, frisk, friskerik, fritzmark, g-bjoza, g-karbe, g-pavgr, haklu, hanke, harka011, henjo, henrikt-ma, hkiel, hubert, jank, jansilar, jensdo, jgillis, jhare950, JKRT, joshbode, jschueller, k Abdelhak, Kaie Kubjas, kajny, Karim, kbalzereit, krsta, laguna, leist, lenaRB, leonardo, leo-recover, lersa, Liebman, lochel, mahge, mahge930, marchartung, mater, mflehmg, modlfo, mohsen, mtiller, mwalthner, niemisto, niklwors, nimen, nutaro, ofstardust, otto@mathcore.com, pavolpr, perost, petar, petfr, phannebohm, pierre-haessig, ppriv, ptaeuber, ptauber, rahulp13, rakhiwarriar, rbulatow, rfranke, ricli576, robbr48, rruusu, RuedKamp, sanguinariojoe, sebco011, SimplyDanny, sjoelund.se, sjoelund, smiz, sp1187, spinnau, stebr461, sturmck, syeas460, tbeu, thieriot, thorade, tmtuomas, Unknown, vaden, vasaie_p, vaurich, vitalij, vomiskam, vruge, vwaurich, wbraun, wibraun, wuzhu.chen, x02danhe, x02kajny, x02lucpo, x05andfe, x05andre, x05simel, x06hener, x06henma, x06klasj, x06krino, x06mikbl, x07simbj, x08joekl, x08kimja, x97davka, x98petro

OpenModelica Project

<http://www.OpenModelica.org>