3DEXPERIENCE®

Dymola 2017 FD01

Overview of new features

2 December 2016

Executive Summary

Modeling and simulation

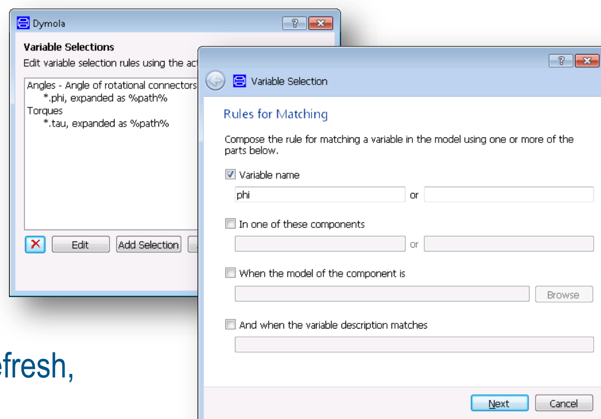
- Editor to configure variable selections, which enables smaller result files and easy plotting of key signals.
- Commands history gives better overview of previous commands and easier selection.
- Improved diagnostics more clearly identifies model translation problems.
- Sparse solver offers substantial speedup for certain kinds of models.

Portfolio changes and new Modelica libraries

- Model calibration, model management and real-time simulation included in standard Dymola, facilitating development of high-quality models.
- Cooling system library for quick dimensioning and lifetime/performance assessment of batteries, electric drives and electronic thermal management.
- Brushless DC Drives library facilitates effective development of drive systems.

Modeling and simulation

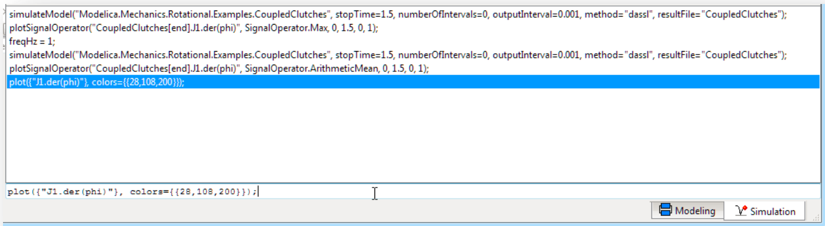
Model editor



- Editor to configure variable selections
  - ▷ Reduces size of simulation result file
  - ▷ Easier to find/group signals
  - ▷ Now much easier to define
- Improvements in Package browser (refresh, safeguards, quick rename, etc.)
- Improved search capability across most Dymola widgets

General improvements

- Improved commands history
  - Better overview of previous commands, direct selection possible



- Restoring settings after restart
  - New XML format for settings, changes always saved and automatically restored
  - Import / Export of settings facilitates custom profiles

Improved diagnostics

- Model translation
  - More clearly identifies the problem
  - Fewer redundant messages
  - Clickable links into model
- Non-linear solver failure diagnostics during simulation
  - Enabled in Simulation>Setup>Debug

Simulation

- Support for Sundials with sparse solver
  - Substantial speedup for some kinds of models
  - Speedup factor 35 with example from Francesco Casella's scalability test suite
- Improved and extended profiling
  - Add time to calculate Analytical Jacobian
  - Smoother handling of granularity

```
model CascadedFirstOrder
  "N cascaded first order systems, approximating a pure delay"
  parameter Integer N = 2000 "Order of the system";
  parameter Modelica.SIunits.Time T = 1 "System delay";
  final parameter Modelica.SIunits.Time tau = T/N "Individual time constant";
  Real x[N]( each start = 0, each fixed = true);
equation
  tau*der(x[1]) = 1 - x[1];
  for i in 2:N loop
    tau*der(x[i]) = x[i-1] - x[i];
  end for;
annotation (
  experiment(StopTime = 2,Tolerance = 1e-6),
  Documentation(info = "<html><p>This model is meant to try out  the tool
      performance with ODE systems of possibly very large size, with high
      sparsity degree.</p>
      <p> The model is a cascaded connection of first order linear systems,
      approximating a pure delay of <tt>T</tt> seconds as <tt>N</tt> approaches
      infinity. It contains exactly <tt>N</tt> state variables and <tt>N</tt>
      differential equations.</p></html>"));
end CascadedFirstOrder;
```


FMI and environment

- Support for input interpolation in FMU import
- FMI Kit for Simulink version 2.3.0
  - Improved input handling
  - FMU export supported also on Linux
- Possibility to stop description information from being stored in result files
- Support for new HIL platform: dSPACE MicroLabBox
- JavaScript interface supported on Linux
- Python interface compatible with Python 3
- Support for Visual Studio 2015

Portfolio changes and new Modelica libraries

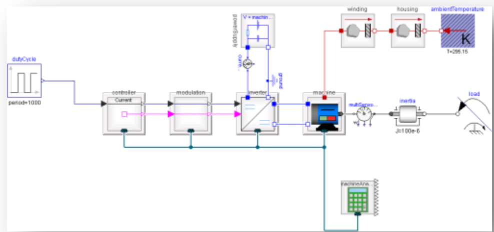
Dymola product portfolio changes

- The functionality of these products become part of the DYM-N and DYM-C configurations
  - MOC-x – Dymola Model Calibration
  - MOM-x – Dymola Model Management
  - RHS-x – Dymola Real-Time Simulation
- Dymola run-time licenses (DYR-x) removed
  - Code export using Binary Model Export (XBM) or Source Code Generation (GSC) are better alternatives because no runtime license must be managed on the target

Brushless DC Drives Library

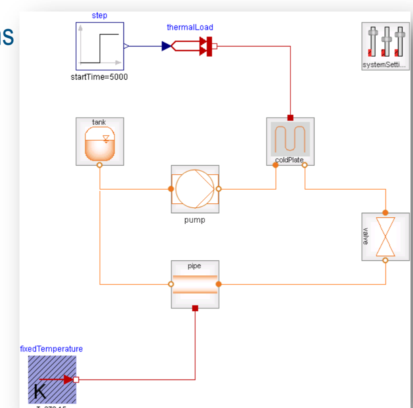
Effective development of drive systems containing brushless DC drives

- Benefits
  - ▷ Wide range of scenarios with different levels of complexity
  - ▷ Simple coupling with other technical domains (mechanical, thermal)
  - ▷ User extension and specialization of the library possible
- Use cases
  - ▷ Speed/torque controller design of powertrains
  - ▷ Loss estimation of electric machine and thermal simulations
  - ▷ Study the effects Voltage and current ripple effect
  - ▷ Compute the system energy consumption



Cooling Systems Library

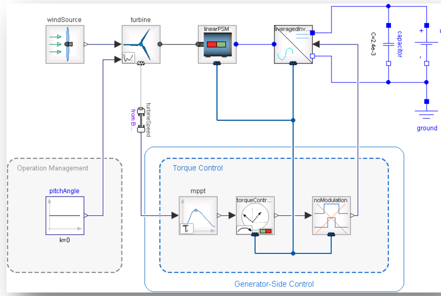
- Benefits
  - ▷ Quickly dimension cooling components to assess sub-systems lifetime and performance
  - ▷ Dedicated to batteries, electric drives and electronic thermal management
  - ▷ Simplifies control development by considering thermal inertia of coolant circuit based on dynamic models
- Features
  - ▷ Boundary conditions, pumps, pipes, valves, reservoirs, heat exchangers, cold plates
  - ▷ Single phase cooling media with thermal dynamics properties
  - ▷ High simulation performance for use cases like drive cycles
  - ▷ Supports 2D temperature analysis of surfaces



Wind Power Library

Rapidly model and simulate wind turbines for optimized performance

- **Benefits**
  - ▷ Components for Turbines, Electric Machines and Controllers, Grid and Power Electronics
  - ▷ Field-oriented control of Permanent-Magnet Synchronous Generator (PMSG)
  - ▷ Voltage-oriented Control of the Grid
  - ▷ Uses Electrified Powertrain Library
- **Use case**
  - ▷ Maximum power point tracking (MPPT) techniques



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