オープンCAEによるModelica活用と
モデルベースデザイン委員会
年間活動報告

オープンCAE学会
モデルベースデザイン委員会
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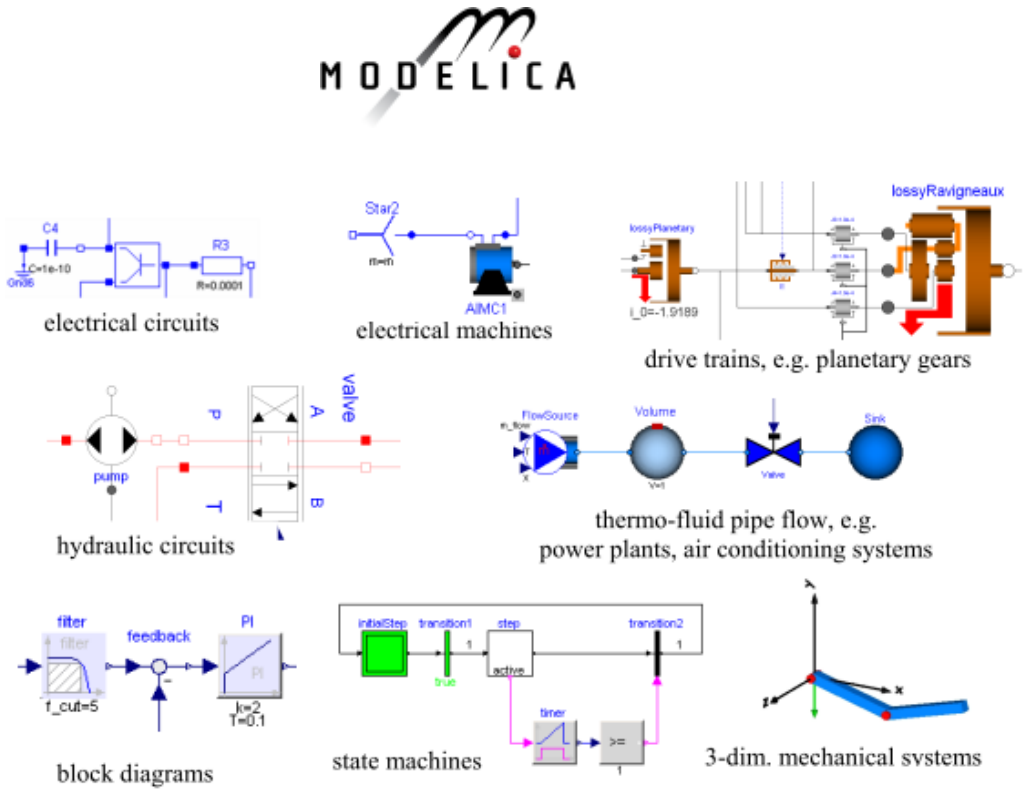
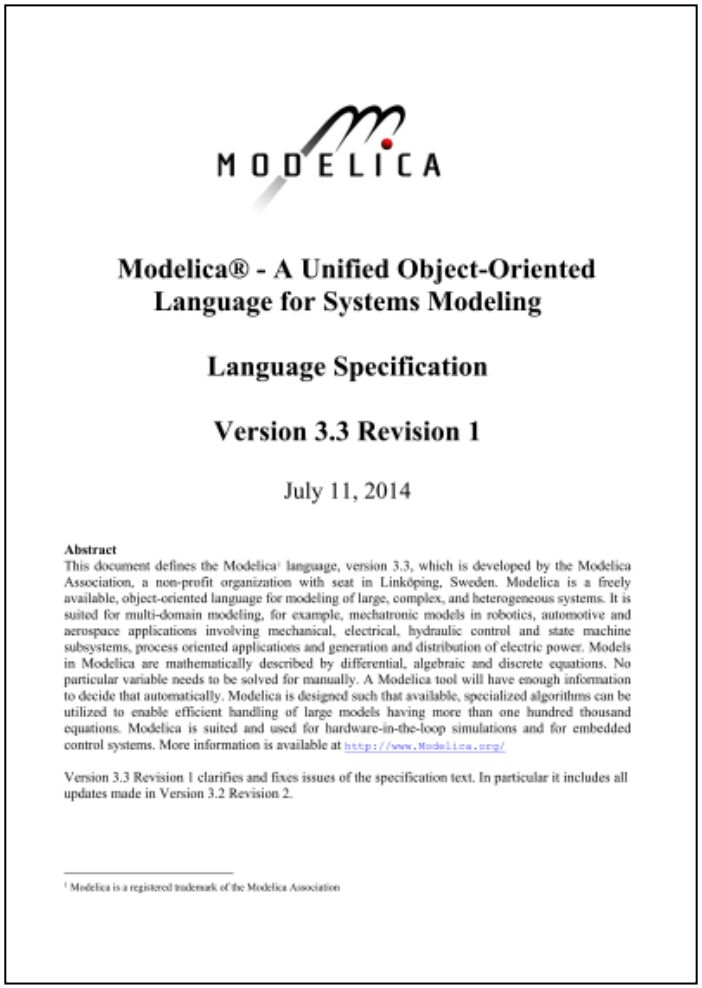
Modelicaとは？

Modelicaは，複雑な物理系を効率的にモデル化するための，プロプラでない，数式ベースのオブジェクト指向言語である.





MODELICA

Modelica® - A Unified Object-Oriented Language for Systems Modeling

Language Specification

Version 3.3 Revision 1

July 11, 2014

Abstract

This document defines the Modelica[1] language, version 3.3, which is developed by the Modelica Association, a non-profit organization with seat in Linköping, Sweden. Modelica is a freely available, object-oriented language for modeling of large, complex, and heterogeneous systems. It is suited for multi-domain modeling, for example, mechatronic models in robotics, automotive and aerospace applications involving mechanical, electrical, hydraulic control and state machine subsystems, process oriented applications and generation and distribution of electric power. Models in Modelica are mathematically described by differential, algebraic and discrete equations. No particular variable needs to be solved for manually. A Modelica tool will have enough information to decide that automatically. Modelica is designed such that available, specialized algorithms can be utilized to enable efficient handling of large models having more than one hundred thousand equations. Modelica is suited and used for hardware-in-the-loop simulations and for embedded control systems. More information is available at http://www.Modelica.org/

Version 3.3 Revision 1 clarifies and fixes issues of the specification text. In particular it includes all updates made in Version 3.2 Revision 2.

[1] Modelica is a registered trademark of the Modelica Association

※ Modelica Overviewより抜粋.
https://www.modelica.org/education/educational-material/lecture-material/english/ModelicaOverview.pdf

さまざまなModelicaライブラリ

OpenCAE

Modelicaには，Modelica言語を使用して記述されたオープンソースもしくは商用のライブラリが存在する． https://www.modelica.org/libraries

Libraries

Colour-code for download buttons:

MA Library (standard conform) | MA Library (not yet standard conform) | MA Library (deprecated) | User Library (with license) | User Library (**no** license) | No official release yet (development version might be available)

Standard conform libraries developed by the MA

Name	Description	Last Release	Last Active
Modelica	Free (standard conform) library from the Modelica Association to model mechanical (1D/3D), electrical (analog, digital, machines), thermal, fluid, control systems and hierarchical state machines. Also numerical functions and functions for strings, files and streams are included.	v3.2.2 (a year ago)	6 days ago
Modelica_Synchronous	Free (standard conform) library to precisely define and synchronize sampled data systems with different sampling rates. It provides convenient to use blocks to utilize the new synchronous language elements introduced in Modelica 3.3.	v0.92.1 (2 years ago)	6 days ago
PowerSystems	Free (standard conform) library that is intended to model electrical power systems at different levels of detail both in transient and steady-state mode.	v0.6.0 (9 months ago)	2 months ago
VehicleInterfaces	Free (standard conform) library from the Modelica Association for interface definitions and architectures for vehicle system modeling	v1.2.4 (a year ago)	18 days ago

Other libraries developed by the MA

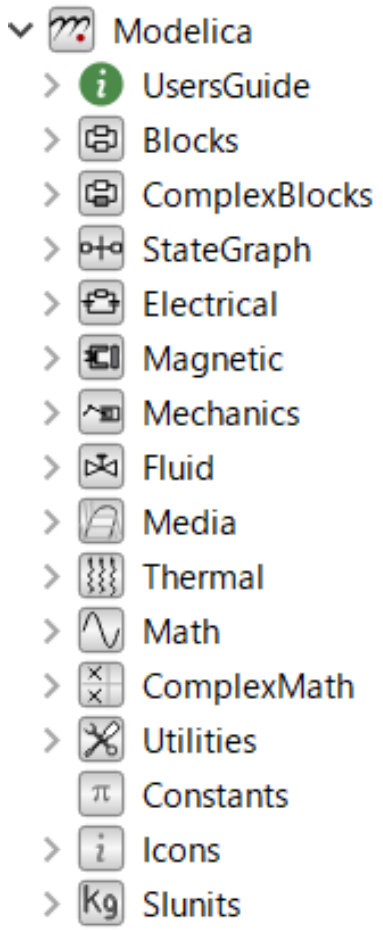
Name	Description	Last Release	Last Active
ElectricalEnergyStorage	Free library that contains models with different complexity for simulating of electric energy storages like batteries (single cells as well as stacks) interacting with loads, battery management systems, loads and charging devices.	N/A	6 months ago
ExternalMedia	The ExternalMedia library provides a framework for interfacing external codes computing fluid properties to Modelica.Media-compatible component models.	N/A	23 days ago
fmi-crosscheck	Functional Mockup Units (FMUs) to cross-check whether various tools can work with the same FMU	N/A	2 months ago
fmi-standard.org	Standard texts and open source software for the Functional Mockup Interface	N/A	15 days ago
Modelica-Compliance	A semantics compliance suite for the Modelica language	N/A	6 days ago
Modelica_DeviceDrivers	Free library for interfacing hardware drivers to Modelica models. There is support for joysticks, keyboards, UDP, TCP/IP, LCM, shared memory, AD/DA converters, serial port and other devices.	v1.5.1 (a month ago)	22 days ago
Modelica_LinearSystems2	Free library providing different representations of linear, time invariant differential and difference equation systems, as well as typical operations on these system descriptions.	v2.3.4 (2 years ago)	22 days ago

※　2017年10月10日現在のキャプチャ

Modelica Standard Library

OpenCAE

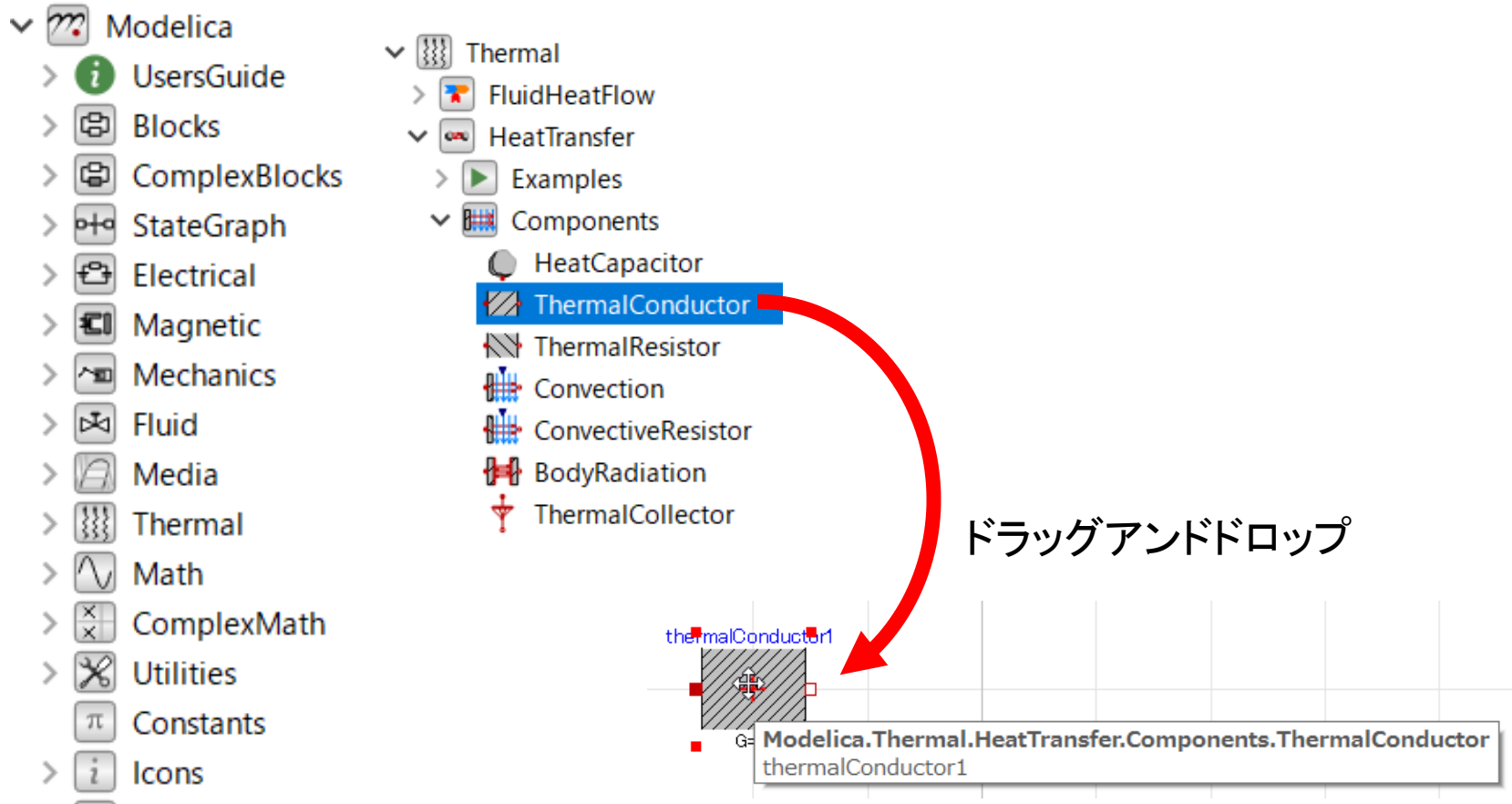
Modelica Standard Library（以下，MSL）は，Modelica Associationが提供する無償のライブラリで，構造，電気，熱，流体，制御系，ステートマシンなどのドメインごとにモデルを構成するためのコンポーネント群を同梱している．　https://github.com/modelica/Modelica



GUIベースのプログラミング

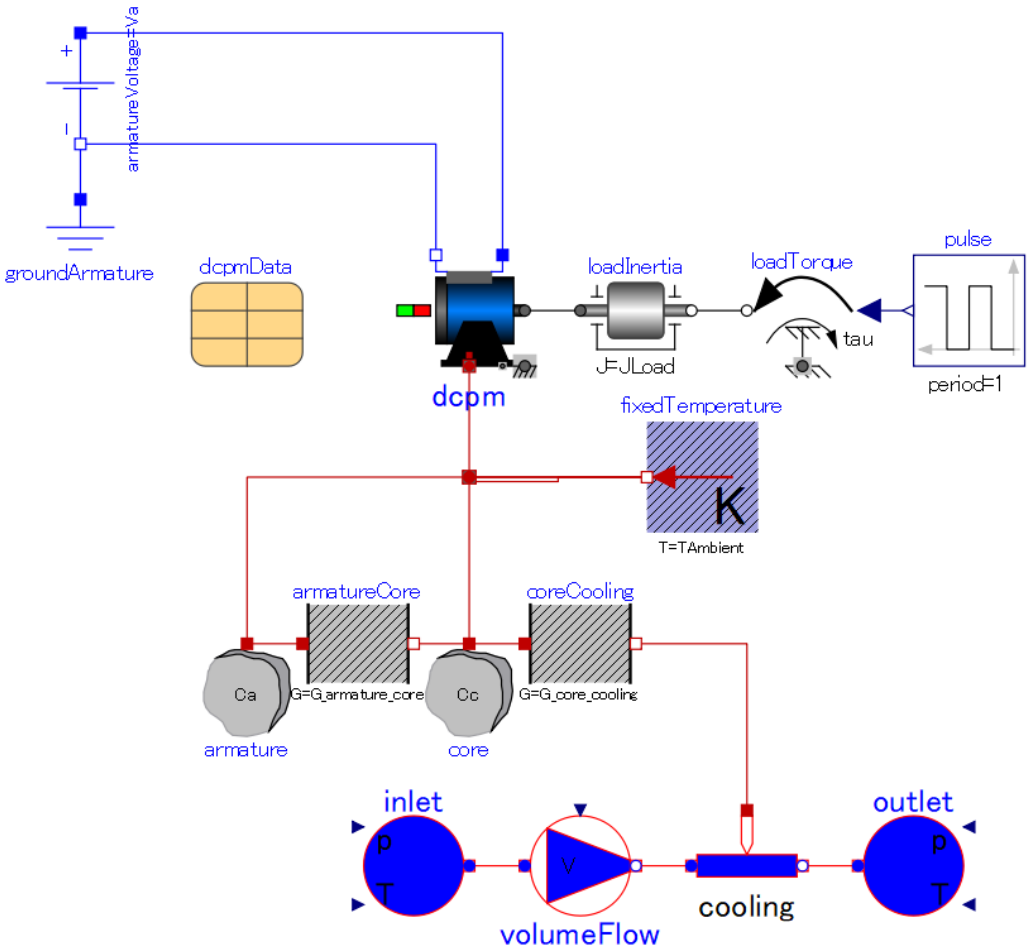
OpenCAE

Modelicaでは，コンポーネントを組み合わせることでモデルを作成できる．



MSLによるマルチドメイン解析 OpenCAE

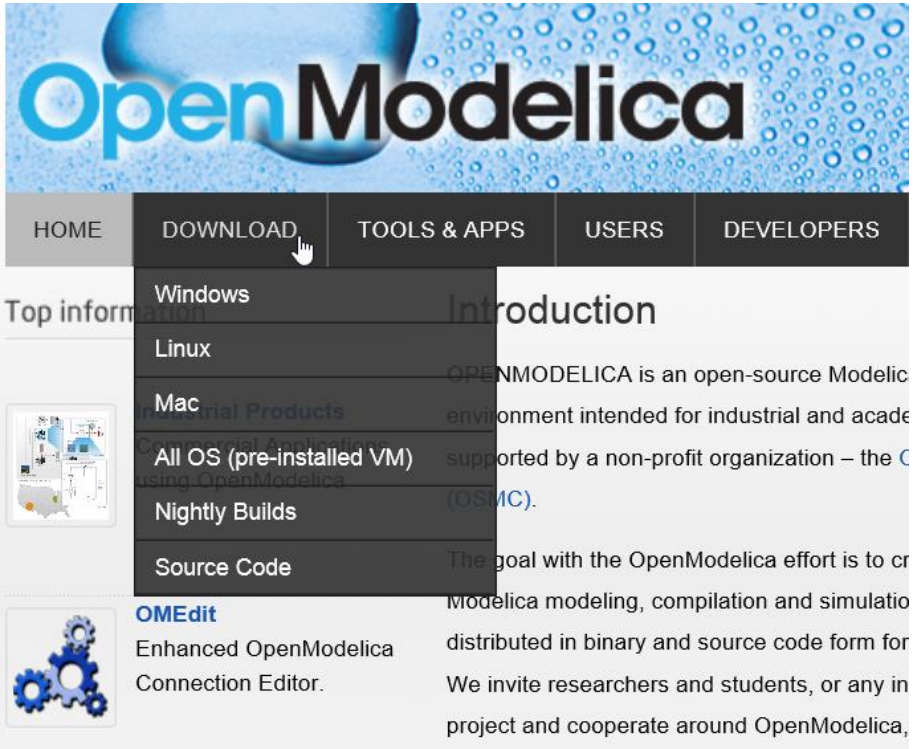
複数のドメインを接続して構成したサンプルも存在する.



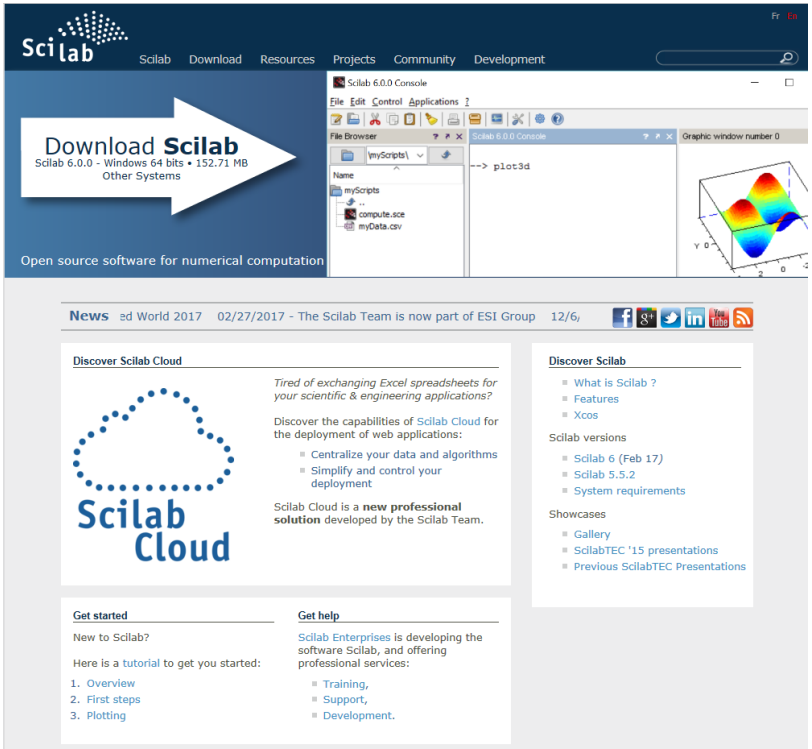
Modelica.Electrical.Machines.Examples.DCMachines.DCPM_Cooling

オープンソースのGUI実行環境

GUIの実行環境には，商用ソフトウェアの他，オープンソースの OpenModelica，Scilabがある．Windows版もあり，初期コストをかけずに，かつ手軽に評価を開始することが可能である．



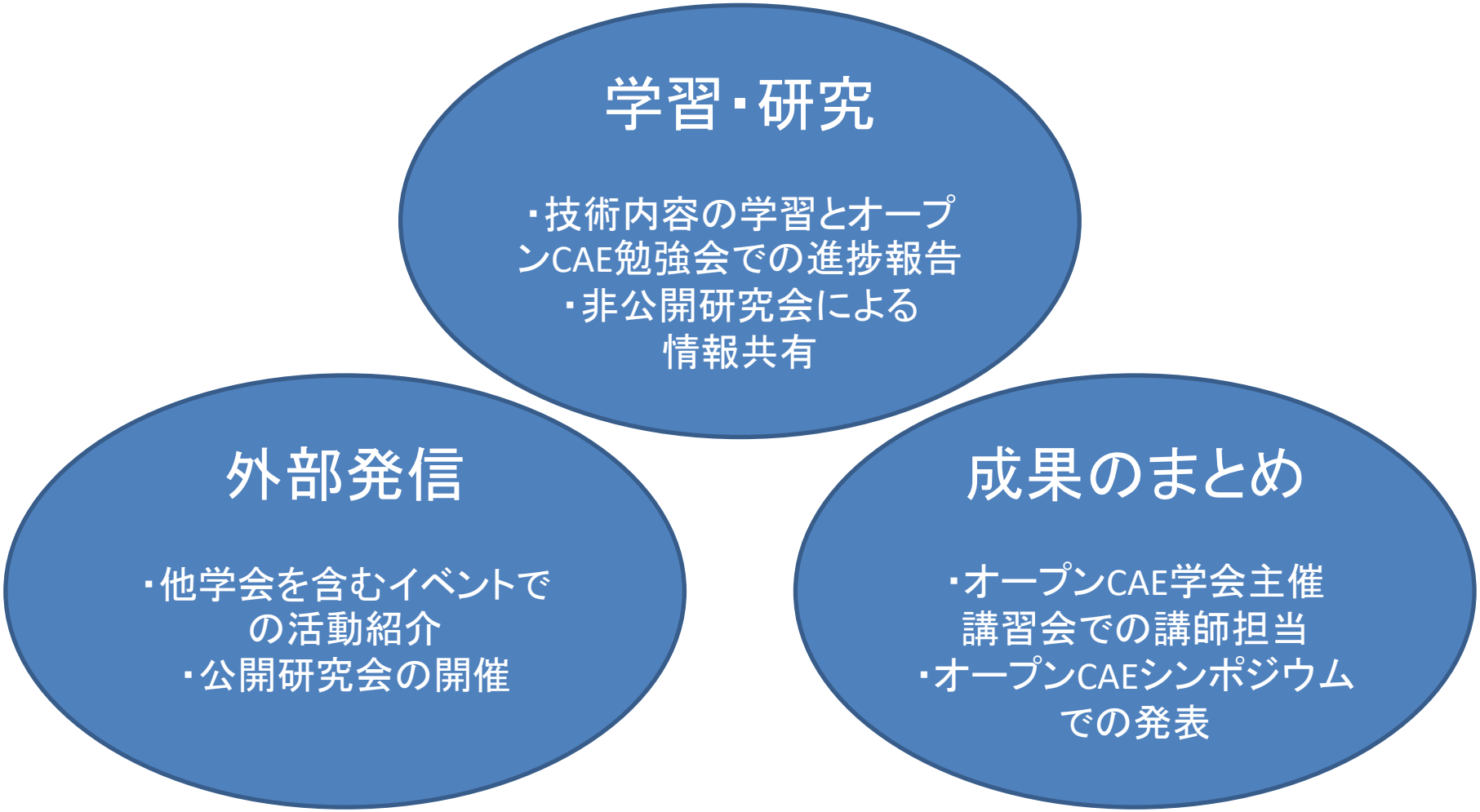
https://www.openmodelica.org/



https://www.scilab.org/

モデルベースデザイン委員会活動

モデルベースデザイン委員会では，OpenModelica，MSLの活用を中心に活動を展開中である.



モデルベースデザイン委員会活動

モデルベースデザイン委員会では，OpenModelica，MSLの活用を中心に活動を展開中である.

＜学習・研究＞
- オープンCAE勉強会@関東（流体など）での進捗報告
- 非公開研究会@品川（2017年2月）

＜外部発信＞
- 日本機械学会北陸流体工学会（2016年12月）
- 日本機械学会RC271分科会（2017年1月）
- 日本学術振興会プロセスシステム工学第143委員会（2017年2月）
- モデルベースデザイン委員会公開研究会@東京（日本橋）（2017年10月）

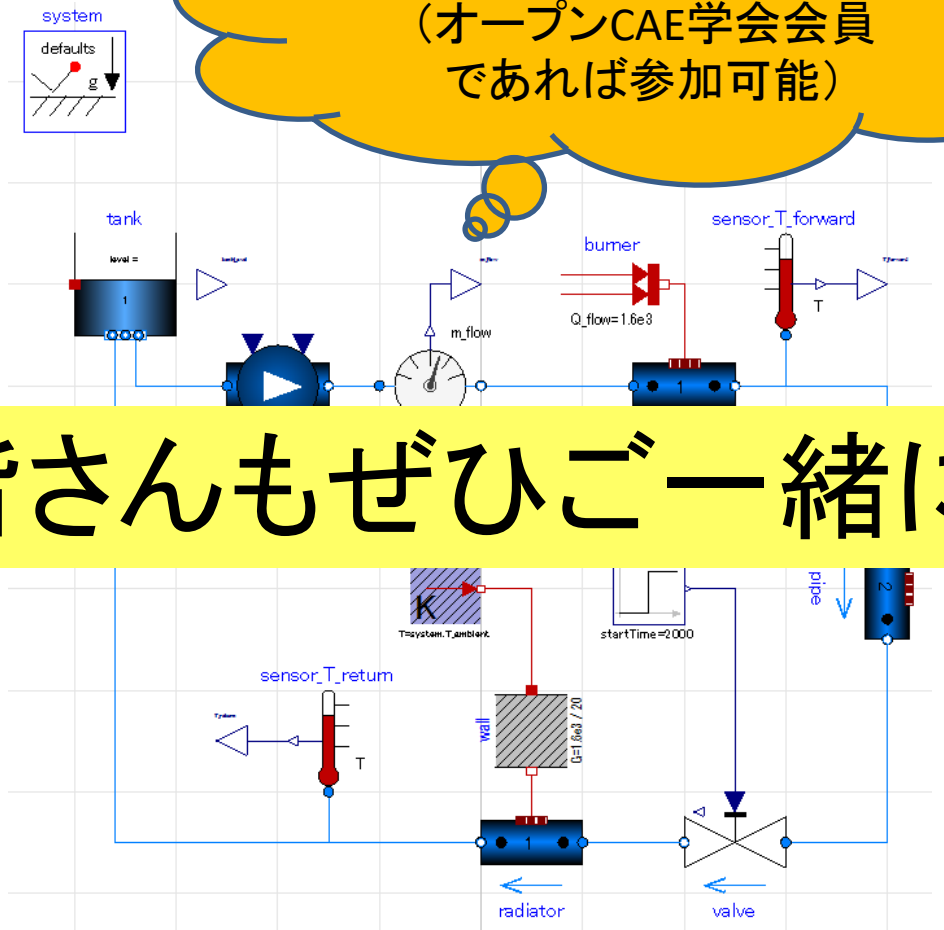
＜成果のまとめ＞
- OpenModelicaを用いた講習会の開催（シンポジウム，総会付帯）
- オープンCAEシンポジウム2016/2017でのセッション開催

モデルベースデザイン委員会

OpenCAE

- Modelica
  - UsersGuide
  - Blocks
  - ComplexBlocks
  - StateGraph
  - Electrical
  - Magnetic
  - Mechanics
  - Fluid
  - Media
  - Thermal
  - Math
  - ComplexMath
  - Utilities
  - Constants
  - Icons
  - SIunits

モデルベースデザイン委員会
では，参加メンバを募集中です．
（オープンCAE学会会員
であれば参加可能）



皆さんもぜひご一緒に！

Modelica.Fluid.Examples.HeatingSystem

モデルベースデザイン委員会