IBPSA Project 1

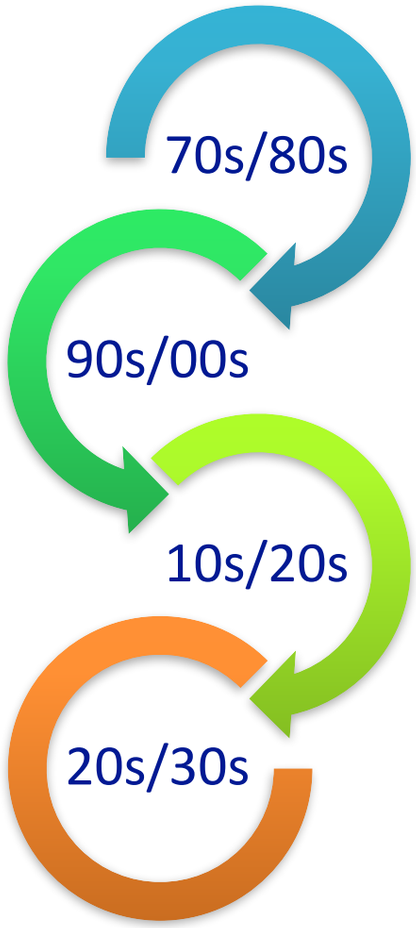
BIM/GIS and Modelica Framework
for
building and community energy system
design and operation

WP 1.1- Modelica Library for Design and Operation

March 28, 2022

Michael Wetter

Work Package 1.1 Goal

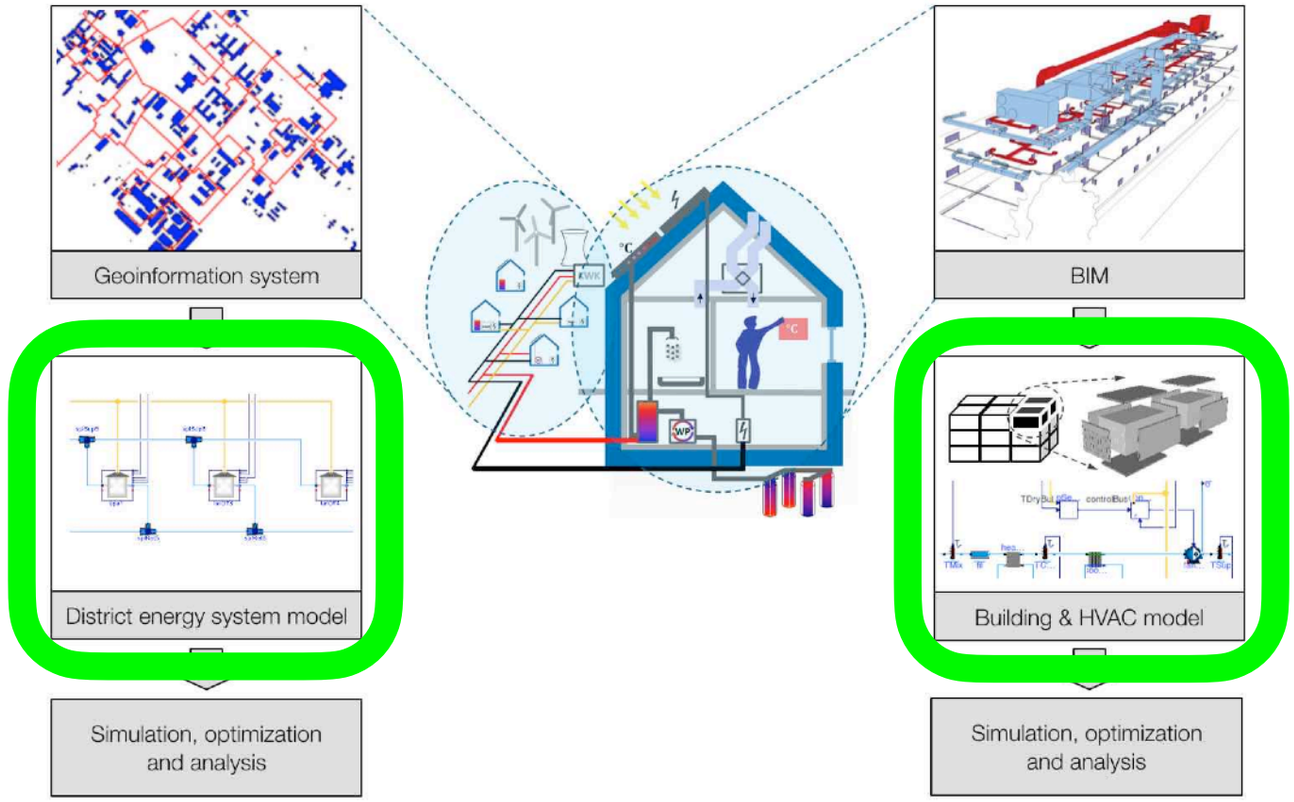


Simulation

Modeling

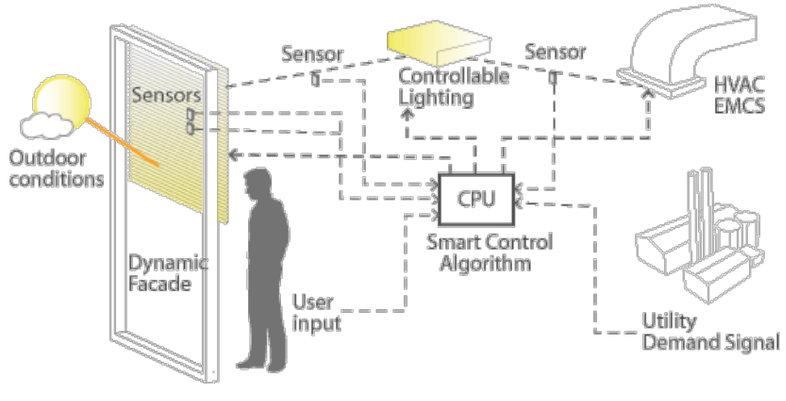
Tool integration

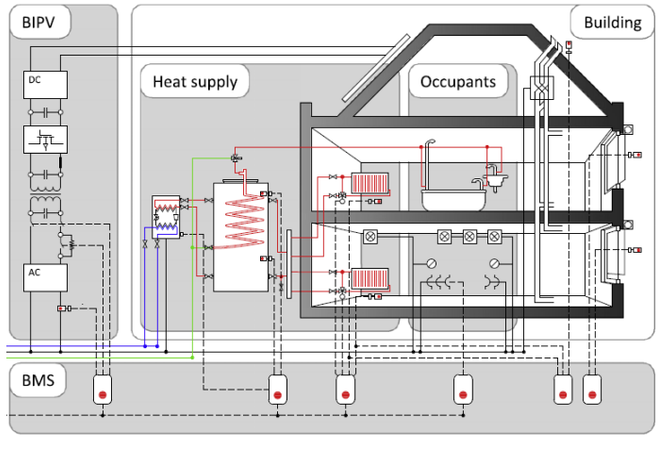
Autonomous modeling

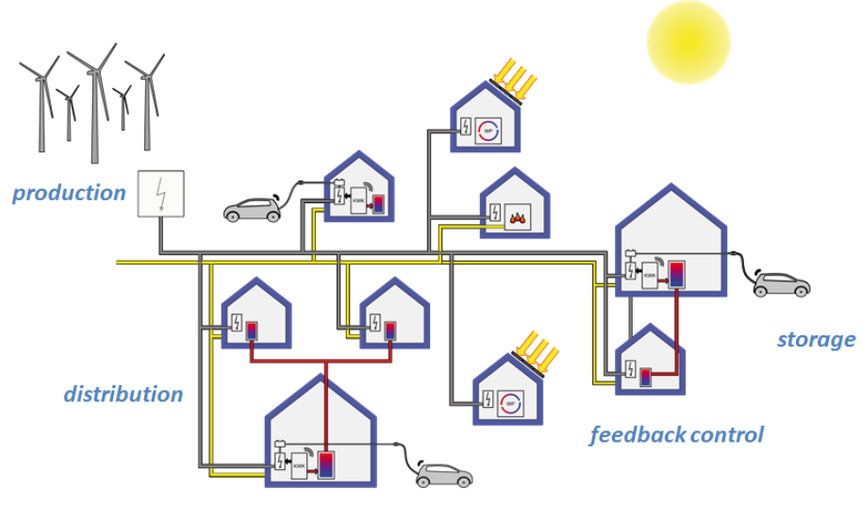


Develop Modelica library applicable for system-level autonomous modeling.

- validated
- well documented
- state-of-the-art physics and dynamics







From controls to buildings and communities

Progress in last half year - Modelica IBPSA Library

Around 30 pull requests have been merged to the master

Updated library to Modelica Standard Library 4.0.0
https://github.com/ibpsa/modelica-ibpsa/pull/1564

Airflow

- Added new models for multizone air exchange
  https://github.com/ibpsa/modelica-ibpsa/pull/1500

Fluid

- Implemented pipe model with plug flow transport equation and discretization along flow path for heat loss
  https://github.com/ibpsa/modelica-ibpsa/pull/1539
- Added coil based on epsilon-NTU approach that models fully dry, partial dry/wet and fully wet conditions
  https://github.com/ibpsa/modelica-ibpsa/pull/1549
- Simplified most fluid models by removing option for massDynamics
  https://github.com/ibpsa/modelica-ibpsa/pull/1591

Numerous smaller improvements.

Progress in last half year - Modelica IBPSA Library

Continuation proposal

- Shared with IBPSA Projects Committee proposal to continue WP 1.1

Challenge problems

- Created repository of challenge problem, now in review by tool developers https://ibpsa.github.io/modelica-challenge-problems/

MSL 4.0

- Updated library to Modelica Standard Library 4.0.0

OpenModelica

- All but one model translates, 98% of models simulate. Improving simulation is funded task for calendar year 2022.

Proposed initial slate for continuation of WP 1.1

Michael Wetter (LBNL, USA)

Saranya Anbarasu (Penn State, USA)

David Blum (LBNL, USA)

Yash Shukla (CEPT University, Ahmedabad, India)

Massimo Cimmino (Polytechnique Montreal, Canada)

Mingzhe Liu (Penn State, USA)

Kathryn Hinkelman (Penn State, USA)

Filip Jorissen (KU Leuven, Belgium)

Klaas de Jonge (Ghent University, Belgium)

Chengnan Shi (Penn State, USA)

Christian Vering (RWTH Aachen, Germany)

Christoph Nytsch-Geusen (UdK Berlin, Germany)

Alessandro Maccarini (Aalborg University, Denmark)

Hongxiang (Casper) Fu (LBNL, USA)

Baptiste Ravache (LBNL, Berkeley)

Wangda Zuo (Penn State, USA)

Progress in last half year - BuildingsPy

30 pull requests have been merged to the master

Mainly improvements for

- Add option to run unit tests using OpenModelica
  https://github.com/lbl-srg/BuildingsPy/pull/454
- Robustness of CI testing
- Improvements to merging and refactoring libraries

Breakout sessions

	Content - title	Presenter/Leader	time
Session 1 (Day 1)			**50 min**
	New and upcoming developments of individual libraries. 10 min each	Filip Jorissen - IDEAS	10 min
		Christian Vering - AixLib	10 min
		Christoph Nytsch-Geusen - BuildingSystems	10 min
		Michael Wetter - Buildings	10 min
	Discussion (10 min, any models/packages to move to IBPSA?)		10 min
Session 2 (Day 1)			55 min
	Heat Pumps	Fabian Wüllhorst, Christian Vering	15 min
	Modelica Challenge Problems	Michael Wetter	15 min
	PV and battery model	Laura Maier, Christian Vering, Christoph Nytsch-Geusen	15 min
Session 3 (Day 2)			1 h 45 min
	Borefield models	Massimo Cimmino	15 min
	Fan efficiency	David Blum/Hongxiang (Casper) Fu	15 min
	Configuring weekly/monthly schedules	Filip Jorissen	15 min
	ASHRAE Standard 231P (Control Des. Lan.)	Michael Wetter	15 min
	VRF models	Massimo Cimmino / Aziz Mbaye	15 min
	New water tank	Christian Vering	15 min
	Ice tank model	Michael Wetter	10 min