PROGRAM OF THE

10th INTERNATIONAL MODELICA CONFERENCE

March 10-12, 2014
Lund, Sweden
www.modelica.org

EDITORS: HUBERTUS TUMMESCHEIT AND KARL-ERIK ÅRZÉN

The Conference is organized by Modelon in collaboration with the Linnaeus center LCCC at Lund University in cooperation with the Modelica Association.

Program of the 10th International Modelica Conference
Lund, Sweden, March 10–12, 2014

EDITORS:
Dr. Hubertus Tummescheit and Prof. Karl-Erik Årzén

ORGANIZED BY:
Modelica Association
c/o PELAB, Linköpings Univ.
SE-581 83 Linköping
Sweden

Modelon AB
IDEON Science Park
SE-223 70 Lund
Sweden

CONFERENCE LOCATION:
Lund University
Matematikcentrum/Matteannexet
(Center for Mathematical Sciences)
Sölvegatan 20A, SE-223 62 LUND
SWEDEN

WELCOME

The 10th International Modelica Conference is the main event for our community. Users, library developers, tool vendors and language designers will gather to share their knowledge and learn about the latest scientific and industrial progress related to Modelica and FMI (Functional Mockup Interface).

This 10th milestone conference returns to Lund, where the first event took place in 2000. Since then, Modelica has matured from an idea among a small number of dedicated enthusiasts to a widely accepted standard language for the modeling and simulation of cyber-physical systems. Modelica is now used in many industries including automotive, energy and process, aerospace, and industrial equipment. Modelica has even been tapped for one-of-a-kind systems engineering designs such as the ESS (European Spallation Source) which is currently being built nearby in Lund. Modelica is the language of choice for modeling and simulation of complex system interactions.

The addition of the FMI standard to the project portfolio under the stewardship of the Modelica Association has greatly strengthened Modelica. FMI provides a complementary standard that enables deployment of high quality models to a larger number of engineers working with system design and verification.

CONFERENCE HIGHLIGHTS:

- 2 Keynote speeches
- 114 papers in 5 parallel tracks
- 23 posters
- 6 tutorials
- 5 libraries for the Modelica Library Award
- 6 vendor sessions presenting the latest Modelica and FMI tools
- A fully booked exhibition area featuring 18 exhibitors
- Electronic proceedings including all papers and some associated Modelica libraries and models

The conference also presents new initiatives from the Modelica Association. Since the last conference, there has been a major effort to improve the standards compliance process for the Modelica language, the Modelica Libraries developed by the Modelica association and the FMI standard.

■ The latest Modelica Standard Library release (MSL 3.2.1) has been enhanced and modified to be fully compliant with the Modelica Language Standards version 3.2 rev2, and is now solely based on open source code under the Modelica License version 2.0.

■ MSL 3.2.1 has also been improved to significantly simplify comparisons of simulations of the same model across multiple Modelica environments. Tools to support such comparisons are now available through the Modelica Association.

■ The Modelica language version 3.2rev 2 fixed many ambiguities in the specification.

■ A Modelica Compliance Test Library has been carefully designed and implemented to verify that a Modelica tool is compliant to the Modelica specification. It has been tested with many tools, with agreed-upon reference results.

■ A set of FMI Cross Check Rules was established in July 2013 and has been used by many vendors to verify tool quality and interoperability. All results are publically presented in a dynamic, online and tabular reference.

These combined efforts have helped to increase the industrial acceptance, commitment to, and use of Modelica and FMI as central standards for analytic model based systems engineering.

Finally, we want to acknowledge the support we received from the program board and program committee. Special thanks to this year's organizers, the Modelica Association, Modelon AB, and Amelie Rönngård from Anagram. Last but not least, let us thank all authors for their contributions to this conference.

We wish all participants an enjoyable and successful conference.

West Hartford and Lund, February 10th 2014
Hubertus Tummescheit and Karl-Erik Årzén

Hubertus Tummescheit

Karl-Erik Årzén

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The Modelica Association gratefully acknowledges the sponsoring of the Welcome Reception by the city of Lund.

KEYNOTE SPEAKERS

Dr. Hilding Elmqvist

CTO Systems, Dassault Systèmes

Elmqvist's Ph.D. thesis in 1978 from the Department of Automatic Control, Lund Institute of Technology contains the design of a novel object-oriented and equation based modelling language, Dymola, and algorithms for symbolic model manipulation.

Elmqvist spent one year in 1978 –1979 at the Computer Science Department at Stanford University, California. His research continued in 1979-1984 on languages for implementation of control systems (LICS). Elmqvist was in 1984-1990 the principal designer and project manager at a subsidiary to Alfa-Laval called SattControl in Malmö for developing SattLine, a graphical, object-oriented and distributed control system. In 1990-1992, he worked for Alfa-Laval in Toronto.

In 1992, Elmqvist founded Dynasim AB (in 2006 acquired by Dassault Systèmes) and in 1996 he initiated the international effort to design the next generation object-oriented language for physical modelling, Modelica.

Elmqvist is Chief Technology Officer for Systems and the chief architect of the Multi-Engineering Modelling and Simulation software for Modelica used in the Dymola Product Line and 3DEXPERIENCE platform. He is also responsible for Technology within the board of Modelica Association.

Clas A. Jacobson, Ph.D.

Chief Scientist,
United Technologies Systems
& Controls Engineering

Dr. Jacobson is Chief Scientist for the United Technologies Systems & Controls Engineering (UTSCE) organization. In this role he works with the UTC business units to ensure capability in systems engineering and controls is available for product development.

Prior to his role as Chief Scientist for UTSCE he worked as the Chief Scientist, Controls for UTC and before that at the United Technologies Research Center (UTRC) in management and technical positions since 1995. He has held positions at UTRC as Director of the Carrier Program Office responsible for creating and managing projects in a stage gate project planning and execution process and also Director of the Systems Department at UTRC responsible for capability in the areas of systems engineering.

Dr. Jacobson received his Ph.D degree in electrical engineering in 1986 from Rensselaer Polytechnic Institute. He was an Associate Professor at Northeastern University in Boston from 1986 –1995.

GENERAL SCHEDULE

GENERAL SCHEDULE OF MONDAY, MARCH 10

	Venue: Matteannexet						
	Common area	**MA1**	**MA2**	**MA3**	**MA4**	**MA5**	**MA6**
14:00		Tutorials					
17:30							
18:00	Welcome Reception						
20:00							

GENERAL SCHEDULE OF TUESDAY, MARCH 11

9:00	Opening Session, **Venue: Aulan, Kårhuset**
9:10	Modelica News
9:25	Keynote 1 Dr. Hilding Elmqvist

	Venue: Matteannexet						
	Common area	**MA1**	**MA2**	**MA3**	**MA4**	**MA5**	**MA6**
10:10	Coffee break						
10:40	Exhibition	FMI 1	Automotive Applications 1	Building Energy Applications 1	Electro-Magnetic Models and Libraries 1	Modelica Language & Compiler Implementation	
12:00	Lunch						
13:20	Exhibition	FMI 2	Automotive Applications 2	Building Energy Applications 2	Electro-Magnetic Models and Libraries 2	Modelica Tools 1	
14:40	Coffee break						
15:10	Exhibition	Automotive Applications: FMI & HIL	Fault Handling and Safety Issues in Modelica	Novel Modelica Applications and Libraries	Electrical Power Systems	Modelica Tools 2	
16:30	Coffee break						
17:00		Modelon VS	LMS VS	ITI VS	Maplesoft VS	OSMC VS	Dassault VS
19:00		Conference Dinner, **Venue: AF Castle**					

GENERAL SCHEDULE OF WEDNESDAY, MARCH 12

8:30	Keynote 2, Dr. Clas A. Jacobson **Venue: Aulan, Kårhuset**
9:15	

	Venue: Matteannexet						
	Common area	**MA1**	**MA2**	**MA3**	**MA4**	**MA5**	**MA6**
9:30	Exhibition	Aerospace 1 Applications	Industrial Equipment	Control Applications	Thermofluid, Systems Models and Libraries 1	Hybrid Systems	
10:30	Coffee break						
11:00	Exhibition	Aerospace Applications 2	Power, Energy & Process Applications 1	Numerical Aspects of Modelica Tools	Thermofluid Systems, Modeles & Libraries 2	Modelica Tools 3	
12:20	Lunch						
13:20		Poster session, **Venue: Matteannexet basement**					
14:00	Exhibition	Mechanical Systems	Power, Energy & Process Applications 2	Optimization Applications and Methods	Thermal Power Processes	Web-related Modelica Tools	
15:20	Coffee break						
15:50		Final Assembly, **Venue: Aulan, Kårhuset**					
		Library Awards					
16:10		Closing session					

TIME	Venue: Aulan, Kårhuset
09:00	**Opening Session**
09:10	**Modelica News**
09:25	**Keynote 1** *Chair: Hubertus Tummescheit.* **Modelica Evolution – From My Perspective** *Dr. Hilding Elmqvist*

Venue: Matteannexet

	MA1	MA2	MA3	MA4	MA5
	FMI 1 Chair: Torsten Blochwitz	**Automotive Applications 1** Chair: Ed Tate	**Building Energy Applications 1** Chair: François Cellier	**Electro-Magnetic Models and Libraries 1** Chair: Sven-Erik Mattsson	**Modelica Language & Compiler Implementation** Chair: Dirk Zimmer
10:40	**The Functional Mockup Interface – seen from an industrial perspective** Christian Bertsch, Elmar Ahle and Ulrich Schulmeister	**Model-based Development of Future Small EVs using Modelica** Yutaka Hirano, Shintaro Inoue and Junya Ota	**Model-Based Design of Integrative Energy Concepts for Building Quarters using Modelica** Torsten Schwan, René Unger, Christian Lerche and Christian Kehrer	**Extension of the Fundamental Wave Library towards Multi Phase Electric Machine Models** Christian Kral, Anton Haumer and Reinhard Wöhrnschimmel	**Custom Annotations: Handling Meta-Information in Modelica** Dirk Zimmer, Martin Otter, Hilding Elmqvist and Gerd Kurzbach
11:00	**An FMI-Based Tool for Robust Design of Dynamical Systems** Maria Henningsson, Johan Åkesson and Hubertus Tummescheit	**Modeling of an Electric Axle Drive with Modelica: A Study of Electric Active Dynamics** Hasan Flaih Awad, Frank Rettig and Tomas Smetana	**Enhancement of the building simulation software TRNSYS by coupling to the VEPZO model programmed in Modelica** Svea Kübler and Victor Norrefeldt	**New Multi Phase Quasi Static Fundamental Wave Electric Machine Models for High Performance Simulations** Christian Kral and Anton Haumer	**Modelica extensions for Multi-Mode DAE Systems** Hilding Elmqvist, Sven Erik Mattsson and Martin Otter
11:20	**Simulating Rhapsody SysML Blocks in Hybrid Models with FMI** Lev Greenberg, Yishai A. Feldman and Eldad Palachi	**Utilizing Object-Oriented Modeling Techniques for Composition of Operational Strategies for Electrified Vehicles** Sebastian Hämmerle, Markus Andres and Marco Keßler	**The Modelica Thermal Model Generation Tool for Automated Creation of a Coupled Airflow, Radiation Model and Wall Model in Modelica** Arnav Pathak, Victor Norrefeldt, Abdellah Lemouedda and Gunnar Grün	**The New EDrives Library: A Modular Tool for Engineering of Electric Drives** Anton Haumer and Christian Kral	**Integrated Debugging of Equation-Based Models** Martin Sjölund, Francesco Casella, Adrian Pop, Adeel Asghar, Peter Fritzson, Willi Braun, Lennart Ochel and Bernhard Bachmann
11:40	**Nonlinear State Estimation with an Extended FMI 2.0 Co-Simulation Interface** Jonathan Brembeck, Andreas Pfeiffer, Michael Fleps-Dezasse, Martin Otter, Karl Wernersson vand Hilding Elmqvist	**Thermal shock testing for Engines in Dymola** Alessandro Picarelli, Eduardo Galindo and Gonzalo Diaz	**Modelling long-wave radiation heat exchange for thermal network building simulations at urban scale using Modelica** Moritz Lauster, Peter Remmen, Marcus Fuchs, Jens Teichmann, Rita Streblow and Dirk Müller	**Modelica Models for Magnetic Hysteresis, Materials and Transformers** Thomas Bödrich and Johannes Ziske	**Making Modelica Applicable for Formal Methods** Matthew Klenk, Daniel Bobrow, Johan De Kleer and Bill Janssen

Venue: Matteannexet

TIME	MA1	MA2	MA3	MA4	MA5
	FMI 2 Chair: Bernard Dion	**Automotive Applications 2** Chair: Mike Dempsey	**Building Energy Applications 2** Chair: Rui Gao	**Electro-Magnetic Models and Libraries 2** Chair: Anton Haumer	**Modelica Tools 1** Chair: Johan Åkesson
13:20	**Implementing stabilized co-simulation of strongly coupled systems using the Functional Mock-up Interface 2.0** Antoine Viel	**Transmission Modeling in Modelica: A consistent approach for several software development platforms** Jochen Köhler, Michael Kuebler and Julian King	**The Modelica HouseModels Library: Presentation and Evaluation of a Room Model with the ASHRAE Standard 140** Ana Constantin, Rita Streblow and Dirk Müllert	**Phenomenological Li-ion battery modelling in Dymola** Kotub Uddin and Alessandro Picarelli	**Verification and Design Exploration through Meta Tool Integration with OpenModelica** Zsolt Lattmann, Adrian Pop, Johan De Kleer, Peter Fritzson, Bill Janssen, Sandeep Neema, Ted Bapty, Xenofon Koutsoukos, Matthew Klenk, Daniel Bobrow, Bhaskar Saha and Tolga Kurtoglu
13:40	**Context-based polynomial extrapolation and slackened synchronization for fast multi-core simulation using FMI** Abir Ben Khaled, Laurent Duval, Mongi Ben Gaid and Daniel Simon	**Vectorized single-track model in Modelica for articulated vehicles with arbitrary number of units and axles** Peter Sundström, Bengt Jacobson and Leo Laine	**Modelica Library for Building and Low-Voltage Electrical AC and DC Grid Modeling** Juan Van Roy, Robbe Salenbien and Johan Driesen	**A Modelica Based Lithium Ion Battery Model** Johannes Gerl, Leonard Janczyk, Imke Krüger and Nils Modrow	**Parallel Model Execution on Many Cores** Hilding Elmqvist, Sven Erik Mattsson and Hans Olsson
14:00	**Model-Based Integration Platform for FMI Co-Simulation and Heterogeneous Simulations of Cyber-Physical Systems** Himanshu Neema, Jesse Gohl, Zsolt Lattmann, Janos Sztipanovits, Gabor Karsai, Sandeep Neema, Ted Bapty, John Batteh, Hubertus Tummescheit and Chandrasekar Sureshkumar	**Multibody Model of a Motorbike with a Flexible Swingarm** Gianni Ferretti, Bruno Scaglioni and Andrea Rossi	**Tool coupling for the design and operation of building energy and control systems based on the Functional Mock-up Interface standard** Thierry Stephane Nouidui and Michael Wetter	**Behavioral Modeling of Power Semiconductors in Modelica** Patrick Denz, Thomas Schmitt and Markus Andres	**A toolchain for Rapid Control Prototyping using Rexroth controllers and open source software** Nils Menager, Niklas Worschech and Lars Mikelsons
14:20	**Adapting Functional Mockup Units for HLA-compliant Distributed Simulation** Faruk Yilmaz, Umut Durak, Koray Taylan and Halit Oğüztüzün	**Modelling and parameter identification of a semi-active vehicle damper** Michael Fleps-Dezasse, Jakub Tobolar and Johannes Pitzer	**Coupling occupant behaviour with a building energy model – A FMI application** Gilles Plessis, Edouard Amouroux and Yvon Haradji		**Modular Multi-Rate and Multi-Method Real-Time Simulation** Bernhard Thiele, Martin Otter and Sven Erik Mattsson

Venue: Matteannexet

TIME	MA1	MA2	MA3	MA4	MA5
	Automotive Applications: FMI & HIL Chair: Peter Harman	**Fault Handling and Safety Issues in Modelica** Chair: Daniel Bouskela	**Novel Modelica Applications and Libraries** Chair: Andreas Uhlig	**Electrical Power Systems** Chair: Anton Haumer	**Modelica Tools 2** Chair: Martin Otter
15:10	**Significant Reduction of Validation Efforts for Dynamic Light Functions with FMI for Multi-Domain Integration and Test Platform** Stefan-Alexander Schneider, Johannes Frimberger and Michael Folie	**General fault triggering architecture to trigger model faults in Modelica using a standardized blockset** Franciscus van der Linden	**The Foundation of the DLR RailwayDynamics Library: the Wheel-Rail-Contact** Andreas Heckmann, Alexander Keck, Ingo Kaiser and Bernhard Kurzeck	**Modelling of Electrical Power Systems with Dynamic Phasors in Modelica** Tao Yang, Serhiy Bozhko and Greg Asher	**impact – A Modelica Package Manager** Michael Tiller and Dietmar Winkler
15:30	**Hardware In The Loop Simulation with Modelica – A Design Tool for Thermal Management Systems** Sidney Baltzer, Thomas Lichius, Jörg Gissing, Peter Jeck, Lutz Eckstein and Jörg Küfen	**Using Fault Augmented Modelica Models for Diagnostics** Raj Minhas, Johan De Kleer, Ion Matei, Bhaskar Saha, Bill Janssen, Daniel Bobrow and Tolga Kurtoglu	**Human-Nature Interaction in World Modeling with Modelica** Rodrigo Castro, Peter Fritzson, François Cellier, Safa Motesharrei and Jorge Rivas	**Flexible modeling of electrical power systems – the Modelica Power Systems library** Rüdiger Franke and Hansjürg Wiesmann	**MoUnit – A Framework for Automatic Modelica Model Testing** Roland Samlaus, Mareike Strach, Claudio Hillmann and Peter Fritzson
15:50	**Integrated Vehicle Thermal Management in Modelica: Overview and Applications** John Batteh, Jesse Gohl and Chandrasekar Sureshkumar	**From Modelica Models to Fault Diagnosis in Air Handling Units** Raymond Sterling, Peter Struss, Jesús Febres, Umbreen Sabir and Marcus Keane	**1D/2D Cellular Automata Modeling with Modelica** Victorino Sanz, Alfonso Urquia and Alberto Leva	**Implementation of a Multi-Level Power Electronic Inverter Library in Modelica** Christopher Hill, Paolo Giangrande, Chris Gerada and Serhiy Bozhko	**Modeling Parameter Sensitivities via Equation-based Algorithmic Differentiation Techniques: The ADMSL.Electrical.Analog Library** Atiyah Elsheikh
16:10	**Virtual Integration for hybrid powertrain development, using FMI and Modelica models** Lionel Belmon	**Simulation for verification and validation of functional safety** Lars Mikelsons and Zhou Su	**Physiolibrary – Modelica library for Physiology** Marek Mateják, Tomáš Kulhánek, Jan Šilar, Pavol Privitzer, Filip Ježek and Jiří Kofránek	**Mixed phasor and time domain modelling of AC networks with changeover management** Hakan Parildar and Alberto Leva	**Modelica Based Parser Generator with Good Error Handling** Arunkumar Palanisamy, Adrian Pop, Martin Sjölund and Peter Fritzson

TIME	Venue: Aulan, Kårhuset				
08:30	**Keynote 2.** *Chair: Hubertus Tummescheit* **Modelica: Systems Engineering, Technology Readiness & Industrial Opportunities** *Dr. Clas A. Jacobson*				
	Venue: Matteannexet				
	MA1	**MA2**	**MA3**	**MA4**	**MA5**
	Aerospace Applications 1 Chair: Michael Sielemann	**Industrial Equipment** Chair: Michael Tiller	**Control Applications** Chair: Maria Henningsson	**Thermofluid Systems, Models and Libraries 1** Chair: Wilhelm Tegethoff	**Hybrid Systems** Chair: Hans Olsson
09:30	**Nonlinear inverse models for the control of satellites with flexible structures** Matthias Reiner and Johann Bals	**Model-Based Energy Recuperation of Multi-Axis Machines** Tamas Juhasz, Matthias Kennel, Marco Franke and Ulrich Schmucker	**Exploiting Actuator Limits with Feedforward Control based on Inverse Models** Manuel Gräber	**Interfacing Models for Thermal Separation Processes with Fluid Property Data from External Sources** Kai Wellner, Carsten Trapp, Gerhard Schmitz and Francesco Casella	**An Operational Semantics for Hybrid Systems Involving Behavioral Abstraction** Simon Bliudze and Sébastien Furic
09:50	**Modelica Stage Separation Dynamics Modeling for End-to-End Launch Vehicle Trajectory Simulations** Paul Acquatella and Matthias Reiner	**A Generalized Power-Based Modelica Library with Application to an Industrial Hydraulic Plant** Ilja Alkov, Robin Diekmann and Dirk Weidemann	**An FMI-based Framework for State and Parameter Estimation** Marco Bonvini, Michael Wetter and Michael D. Sohn	**Development of a Real-Time Fuel Processor Model for HIL Simulation** Karin Fröjd, Karin Axelsson, Ivar Torstensson, Erik Åberg, Erik Osvaldsson, Gregor Dolanc, Bostjan Pregelj, Jonas Eborn and Jens Pålsson	**An example of beneficial use of variable-structure modeling to enhance an existing rocket model** Alexandra Mehlhase, Daniel Gomez Esperon, Julien Bergmann and Marcel Merkle
10:10	**A Modelica Library for Scalable Modelling of Aircraft Environmental Control Systems** Philip Jordan and Gerhard Schmitz	**Physical Design of Hydraulic Valves in Modelica** Chandrasekar Sureshkumar and Hubertus Tummescheit	**Grey-box Building Models for Model Order Reduction and Control** Roel De Coninck, Fredrik Magnusson, Johan Åkesson and Lieve Helsen	**ThermoCycle: A Modelica library for the simulation of thermodynamic systems** Sylvain Quoilin, Adriano Desideri, Jorrit Wronski, Ian Bell and Vincent Lemort	**Efficient Monte Carlo simulation of stochastic hybrid systems** Marc Bouissou, Hilding Elmqvist, Martin Otter and Albert Benveniste

Venue: Matteannexet

TIME	MA1	MA2	MA3	MA4	MA5
	Aerospace Applications 2 Chair: Chad Schmitke	**Power, Energy & Process Applications 1** Chair: Leo Gall	**Numerical Aspects of Modelica Tools** Chair: Bernhard Bachmann	**Thermofluid Systems, Models and Libraries 2** Chair: John Batteh	**Modelica Tools 3** Chair: Dan Henriksson
11:00	**The Modelica BehaviorTrees Library: Mission Planning in Continuous-Time for Unmanned Aircraft** Andreas Klöckner	**An Optimization Framework for Dynamic Hybrid Energy Systems** Wenbo Du, Humberto Garcia and Christiaan Paredis	**Parameter Selection in a Combined Cycle Power Plant** Niklas Andersson, Johan Åkesson, Kilian Link, Stephanie Gallardo Yances, Karin Dietl and Bernt Nilsson	**A physical solution for solving the zero-flow singularity in static thermal-hydraulics mixing models** Daniel Bouskela and Baligh El Hefni	**A new Implementation of the N-D Lookup Tables** Markus Andres, Stephan Diehl and Torsten Sommer
11:20	**Multi-Level Library of Electrical Machines for Aerospace Applications** Paolo Giangrande, Christopher Hill, Chris Gerada and Serhiy Bozhko	**Industrial application of optimization with Modelica and Optimica using intelligent Python scripting** Karin Dietl, Stephanie Gallardo Yances, Anna Johnsson, Johan Åkesson, Kilian Link and Stéphane Velut	**Restarting algorithms for simulation problems with discontinuities** Fatemeh Mohammadi, Carmen Arévalo and Claus Führer	**Advanced Hybrid Model for Borefield Heat Exchanger Performance Evaluation, an Implementation in Modelica** Damien Picard and Lieve Helsen	**Remarks on the Implementation of the Modelica Standard Tables** Thomas Beutlich, Gerd Kurzbach and Uwe Schnabel
11:40	**Modelica for large scale aircraft electrical network V&V** Martin R. Kuhn and Yang Ji	**Simulation of Smart-Grid Models using Quantization-Based Integration Methods** Xenofon Floros, Federico Bergero, Nicola Ceriani, Francesco Casella, Ernesto Kofman and François Cellier	**Discontinuities handled with events in Assimulo** Emil Fredriksson, Christian Andersson and Johan Åkesson	**Superheat Control with a Dynamic Inverse Model** Andreas Varchmin, Manuel Gräber, Wilhelm Tegethoff and Jürgen Köhler	**The DLR Visualization Library – Recent development and applications** Matthias Hellerer, Tobias Bellmann and Florian Schlegel
12:00	**Implementation of a Modelica Library for Simulation of Electro-mechanical Actuators for Aircraft and Helicopters** Franciscus van der Linden, Clemens Schlegel, Markus Christmann, Gergely Regula, Christopher Hill, Paolo Giangrande, Jean-Charles Maré and Imanol Egaña	**On the Simulation of Offshore Oil Facilities at the System Level** Joris Costes, Jean-Michel Ghidaglia, Philippe Muguerra, Keld Lund Nielsen, Xavier Riou, Jean-Philippe Saut and Nicolas Vayatis	**Noise Generation for Continuous System Simulation** Andreas Klöckner, Franciscus van der Linden and Dirk Zimmer	**Adsorption energy systems library – Modeling adsorption based chillers, heat pumps, thermal storages and desiccant systems** Uwe Bau, Franz Lanzerath, Manuel Gräber, Stefan Graf, Heike Schreiber, Niklas Thielen and André Bardow	**Automated Modelica Package Generation of Parameterized Multibody Systems in CATIA** Daniel Baumgartner and Andreas Pfeiffer

TIME	Venue: Matteannexet Basement				
13:20	***Poster Session, See list of posters***				
	Venue: Matteannexet				
	MA1	**MA2**	**MA3**	**MA4**	**MA5**
	Mechanical Systems Chair: Johannes Gerl	**Power, Energy & Process Applications 2** Chair: Michael Sasena	**Optimization Applications and Methods** Chair: Stéphane Velut	**Thermal Power Processes** Chair: Rüdiger Franke	**Web-related Modelica Tools** Chair: Peter Fritzson
14:00	**Modelling elastomer buffers with DyMoRail** Elisabeth Dumont and Werner Maurer	**Short-term production planning for district heating networks with JModelica.org** Stéphane Velut, Per Ola Larsson, Linn Saarinen, Katarina Boman and Johan Windahl	**Modified Multiple Shooting Combined with Collocation Method in JModelica.org with Symbolic Calculations** Evgeny Lazutkin, Abebe Geletu, Siegbert Hopfgarten and Pu Li	**Modelling a Lignite Power Plant in Modelica to Evaluate the Effects of Dynamic Operation and Offering Grid Services** Moritz Huebel, Sebastian Meinke and André Berndt	**Vehicle Thermal Management – A Case Study in Web-Based Engineering Analysis** Michael Tiller
14:20	**A Modelica Contact Library for Idealized Simulation of Independently Defined Contact Surfaces** Felix Oestersötebier, Peng Wang and Ansgar Trächtler	**Modelling the system dynamics of islanding asynchronous generators** Dietmar Winkler and Håkon Molland Edvardsen	**DOML - a Compiler Environment for Dynamic Optimization Supporting Multiple Solvers** Tomasz Tarnawski and Radosław Pytlak	**Use of External Fluid Property Code in Modelica for Modelling of a Pre-combustion CO2 Capture Process Involving Multi-Component, Two-Phase Fluids** Carsten Trapp, Francesco Casella, Teus van der Stelt and Piero Colonna	**recon – Web and network friendly simulation data formats** Michael Tiller and Peter Harman
14:40	**The OneWind Modelica Library for Wind Turbine Simulation with Flexible Structure - Modal Reduction Method in Modelica** Philipp Thomas, Xin Gu, Roland Samlaus, Claudio Hillmann and Urs Wihlfahrt	**Hybrid Energy System Modeling in Modelica** William Binder, Christiaan Paredis and Humberto Garcia	**Efficient Implementation of Collocation Methods for Optimization using OpenModelica and ADOL-C** Vitalij Ruge, Willi Braun, Bernhard Bachmann, Andrea Walther and Kshitij Kulshreshtha	**Dynamic modelling of a parabolic trough solar power plant** Robert Österholm and Jens Pålsson	**IDOS – (also) a Web Based Tool for Calibrating Modelica Models** Radosław Pytlak and Tomasz Tarnawski
15:00	**Simulating Collisions within the Modelica MultiBody library** Andreas Hofmann, Lars Mikelsons, Ines Gubsch and Christian Schubert	**Dynamic Modeling of Small Modular Nuclear Reactors using MoDSim** Richard Hale, Sacit Cetiner, David Fugate, Lou Qualls, John Batteh and Michael Tiller	**Symbolic Transformations of Dynamic Optimization Problems** Fredrik Magnusson, Karl Berntorp, Björn Olofsson and Johan Åkesson	**Testing Power Plant Control Systems in Modelica** Kilian Link, Leo Gall, Julien Bonifay and Matthias Buggert	**Client-side Modelica powered by Python or Java Script** Rüdiger Franke
	Venue: Aulan, Kårhuset				
15:50	***Final Assembly*** ***Library Awards***				

POSTER SESSIONS

Wednesday 13.00–14.00 there will be poster sessions held downstairs from the Exhibition and Session hall entrances.

Dynamic modelling of a Condenser with the ThermoSysPro Library
Baligh El Hefni and Daniel Bouskela

Symbolic Initialization of Over-determined Higher-index Models
Lennart Ochel, Bernhard Bachmann and Francesco Casella

Integration of OpenModelica in Ptolemy II
Mana Mirzaei, Lena Rogovchenko-Buffoni and Peter Fritzson

Model-based Verification and Optimization of Batteries for Mobile Power Applications
Marco Franke, Tamas Juhasz and Ulrich Schmucker

Proposal for standardization of Heat Transfer Modelling in NewThermal Library
Susana López Pérez and Itzal Del Hoyo Arce

Extending JGrafchart with Support for FMI for Co-Simulation
Alfred Theorin and Charlotta Johnsson

Wavelet Library for Modelica
Jianbo Gao, Yang Ji, Johann Bals and Ralph Kennel

Systems Physics Library
Werner Maurer and Elisabeth Dumont

Implementation of the Omni Vehicle Dynamics on Modelica
Ivan Kosenko

A Modelica Power System Component Library for Model Validation and Parameter Identification
Luigi Vanfretti, Tetiana Bogodorova and Maxime Baudette

Modelica Model for the youBot Manipulator
Rhama Dwiputra, Alexey Zakharov, Roustiam Chakirov and Erwin Prassler

A Medium Model for the Refrigerant Propane for Fast and Accurate Dynamic Simulations
Roozbeh Sangi, Pooyan Jahangiri, Freerk Klasing, Rita Streblow and Dirk Müller

Control and Characteristic Map Generation of Permanent Magnet Synchronous Machines and Induction Machines with Squirrel Cage
Marco Keßler, Markus Andres and Thomas Schmitt

Equation based parallelization of Modelica models
Marcus Walther, Volker Waurich, Christian Schubert and Ines Gubsch

Consistent Simulation Environment with FMI based Tool Chain
Edo Drenth, Mikael Törmänen, Krister Johansson, Bengt-Arne Andersson, Daniel Andersson, Ivar Torstensson and Johan Åkesson

BuildSysPro: a Modelica library for modelling buildings and energy systems
Gilles Plessis, Aurelie Kaemmerlen and Amy Lindsay

Simulation of 2-dimensional flows in Modelica with the Casacaded Digital Lattice Boltzmann Method
Thomas Baeuml and Helmut Kühnelt

A MATLAB to Modelica Translator
Mohammad Jahanzeb, Arunkumar Palanisamy, Martin Sjölund and Peter Fritzson

Efficient Numerical Integration of Dynamical Systems based on Structural-Algebraic Regularization avoiding State Selection
Lena Scholz and Andreas Steinbrecher

FORM-L: A MODELICA Extension for Properties Modelling Illustrated on a Practical Example
Thuy Nguyen

Setting up a framework for model predictive control with moving horizon state estimation using JModelica
Mats Vande Cavey, Roel De Coninck and Lieve Helsen

Development of Custom Workflows for Simulation and Analysis of Functional Mock-up Units
Chandrasekar Sureshkumar and Jesse Gohl

Statecharts as a Means to Control Plant Models in LMS Imagine.Lab AMESim
Sébastien Furic, Loïc Wagner and Vincent Berthoux

TUTORIALS

The tutorials are free of charge, and will be held held at Matteannexet Monday, March 10th, 14:00 – 17:45. Coffee break is included.

Simulation and Optimization with JModelica.org and CasADi

Modelon AB, Johan Åkesson (contact) and the JModelica.org team), Lund Center for Control of Complex Engineering Systems (LCCC) (Fredrik Magnusson) and Joel Andersson, developer of CasADi.

Optimization of non-linear dynamic systems is gaining increased industrial adoption. Key applications include trajectory optimization, Model Predictive Control (MPC), model calibration, state estimation, and design/sizing problems. This tutorial is based on a novel interactive tool-chain which combines the expressiveness and user-friendliness of Modelica and the optimization extension Optimica, with the speed, flexibility and robustness of a modern computational framework dedicated to optimization. Several hands on exercises are offered to demonstrate the capabilities of the new tool-chain, including parameter estimation, trajectory optimization and MPC. Two common methods, collocation and multiple shooting, will be used to solve dynamic optimization problems. In addition, simulation of Modelica models using Python scripting will be demonstrated. Pitfalls and challenges encountered in dynamic optimization of industrial processes are high-lighted. The tutorial is based on the open source software JModelica.org, PyFMI/Assimulo and CasADi.

Introduction to Modeling, Simulation, Debugging, and Optimization with Modelica using OpenModelica

Peter Fritzson, Lena Buffoni, Martin Sjölund, Linköpping University, Sweden and Bernhard Bachmann, Fachhochschule Bielefeld, Germany

Object-Oriented modeling is a fast-growing area of modeling and simulation that provides a structured, computer-supported way of doing mathematical and equation-based modeling. Modelica is today the most promising modeling and simulation language in that it effectively unifies and generalizes previous object-oriented modeling languages and provides a sound basis for the basic concepts. The Modelica modeling language is bringing about a revolution in this area, based on its ease of use, visual design of models with combination of lego-like predefined model building blocks, its ability to define model libraries with reusable components, its support for modeling and simulation of complex applications involving parts from several application domains, and many more useful facilities.

The tutorial presents an object-oriented component-based approach to computer supported mathematical modeling and simulation through the powerful Modelica language and its associated technology. Modelica can be viewed as an almost universal approach to high level computational modeling and simulation.

The tutorial gives an introduction to the Modelica language to people who are familiar with basic programming concepts. It gives a basic introduction to the concepts of modeling and simulation, as well as the basics of object-oriented component-based modeling for the novice, and an overview of modeling and simulation in a number of application areas. The OpenModelica environment with its graphical user interface and scripting will be used for hands-on exercises.

Moreover, in parallel, for those who already know Modelica, a session on debugging of equation-based models will be given, as well as a short introduction to dynamic optimization (collocation/multiple shooting) with OpenModelica.

Modeling and Simulation of Electrical Drives

Anton Haumer, Haumer Technical Consulting, and Christian Kral, TGM, Austria

The tutorial starts with an introduction to electric machines. This includes induction machines and permanent magnet synchronous machines. Simple applications of starting and operating the machines will be presented using the Machines packages of the Modelica Standard Library: Electrical.Machines and Magnetic.FundamentalWave.
The new developments will be discussed: extension to multiphase machines with phase numbers greater than 3, and the quasi static implementation based on time domain phasors for highest performance of long term simulations. For operating electric machines at variable speed usually closed loop drives are used. The basic principle of a closed loop drive system will be explained. For the examples presented in this tutorial a preview version of the newly developed EDrives library will be utilized. An overview of

the structure of the basic components (machine, power electronics, sensors, control) will be given. An introduction to space phasors used in field oriented control is given, followed by an outline of the basics of controlling permanent magnet synchronous machines.

The torque controlled drive models of a permanent magnet synchronous machine are presented. For these drive types the differences between different combinations of inverter and machine models will be compared:

- quasi static inverter + quasi static machine
- averaging inverter + transient machine
- switching inverter + transient machine

After these examples the usage of a speed controller is shown. These examples will demonstrate the use of predefined records for convenient parameterization of both the machine and the control, based on machine parameters as used in the Modelica Standard Library.

Advanced Analysis of Modelica Models using MapleSim and Maple

Orang Vahid and Stefan Vorkoetter, Maplesoft, Canada

Since its inception, Modelica has held the promise of letting engineers go further with physical modeling than just running simulations. With the connection between MapleSim and Maple, users can create and document their own symbolic and numeric analyses of Modelica models in a rich problem-solving environment, in addition to performing traditional simulations.

This tutorial will guide you through the process of extracting equations from a Modelica model into a form amenable to a wide range of analysis. Through hands-on exercises, it will provide you with basic skills to solve, analyse, manipulate, and simulate these equations.

Examples will include: extracting, interrogating, and solving kinematic and dynamic equations from multibody models; creating, manipulating and discretizing PDEs; creating Modelica components from derived equations; setting-up parameter sweeps and optimizations on Modelica models.

Modeling Renewable Energy Systems with "Green Building"

Dipl.-Ing. Torsten Schwan, EA Systems Dresden GmbH and Dipl.-Ing. Christian Kehrer, ITI GmbH

This tutorial outlines the advantages of a dedicated library for modeling environmentally friendly building systems and energy management concepts. Based on the Modelica language, ITI developed the Green Building library for SimulationX in close collaboration with EA Systems and the Dresden University of Technology. This unique library enables simulations of smart home systems for autonomous buildings that are able to handle their inhabitants' energy demand and all available resources from conventional supplies to renewables.

The tutorial explains the underlying concept of the Green Building library. It demonstrates available components and usability to create individual layouts of energy efficient buildings accounting for a variety of input data, e.g. consumer demand, climate, e-Mobility and energy prices. Users learn how to model, analyze and compare different system configurations, e.g. regarding energy and life cycle costs (incl. investment, consumption, subsidies, degradation, maintenance), to find the optimal energy management solution.

Modeling conventional homes, renewable energy charging stations for electric vehicles and multi-zone buildings illustrate the capabilities of 'Green Building' and SimulationX.

Functional Mockup Interface 2.0 and HiL Applications

FMI Modelica Association Project, Dassault Systemés, DLR, ITI and Modelon

FMI 2.0 has many important extensions compared to FMI 1.0. This tutorial will give an overview about these new capabilities and the roadmap for the next year. Automotive OEMs and suppliers present FMI use cases and workflows. Leading HiL providers demonstrate the FMI support of their systems.

The Modelica FMI test package is introduced which contains test cases for connected FMUs. In practical demonstrations it is shown how FMUs with complex interactions such as coupled mechanical systems can be handled using FMI 2.0. The FMI compliance checker will be utilized for testing the conformity with the specification. It will be shown how FMUs generated by different authoring tools are integrated with a HiL platform.

This tutorial is useful for end users, decision makers and for tool vendors about to implement support for FMI 2.0.

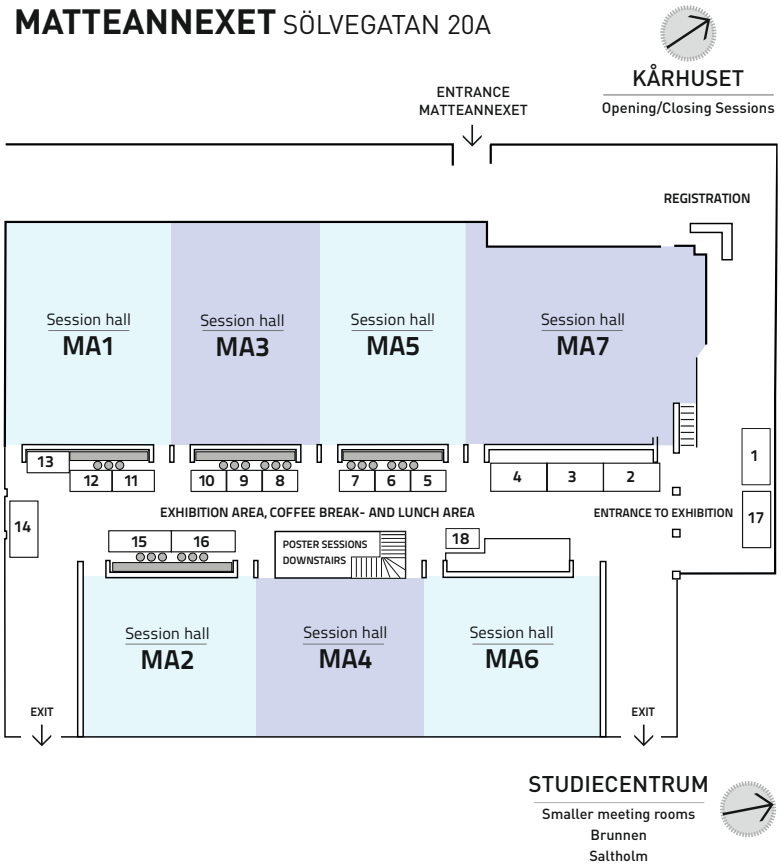
EXHIBITION

A commercial exhibition will take place at the venue, Matteannexet, and will be open:

Tuesday 09.30–17.00
Wednesday 09.00–16.00

VENDOR	EXHIBITION STAND
Modelon AB	1
Dassault Systems	2
Esterel Technologies/Ansys	3
Maplesoft Europe GmbH	4
Schlegel Simulation GmbH	5
Bausch-Gall GmbH	6
Cenit AG	7
XRG Simulation GmbH	8
Open Source Modelica Consortium	9
Claytex Services Limited	10
Cydesign Labs	11
D2T	12
ETAS GmbH	13
ITI GmbH	14
Concurrent Real-Time	15
LMS International	16
Wolfram Research	17
IPG Automotive	18

MATTEANNEXET SÖLVEGATAN 20A



VENDOR SESSION

Program of the Vendor Session on Tuesday, March 11

	VENUE: MATTEANNEXET					
	MA1	MA2	MA3	MA4	MA5	MA6
	Modelon AB	**LMS International**	**ITI GmbH**	**Maplesoft Inc.**	**Open Source Modelica Consortium**	**Dassault Systèmes**
17:00	Modelica & FMI products	LMS Imagine.Lab AMESim	SimulationX	MapleSim	OpenModelica	Dymola & CATIA
18:00	M. Engström, J. Åkesson, C. Wilhelmsson	N. Orand, M. Sasena	A. Magdanz	Paul Goossens	P. Fritzson, A. Pop, B. Bachmann	H. Elmqvist, M. Frouin, G. Terpant

PRACTICAL INFORMATION

Venue
The meeting will take place at Matteannexet / Matematikcentrum, the Center of Mathematical Sciences located in the centre of Lund, approximately 15 minutes walking distance from Lund Central Station. Opening and closing ceremony is held at Kårhuset (across the street from the conference venue Center of Mathematical Sciences).

Venue Address
Matematikcentrum/Matteannexet
(Center for Mathematical Sciences)
Address: Sölvegatan 20A, 223 62 LUND, Sweden

Please note that the following information is in alphabetical order

Exhibition
A commercial exhibition will take place at the venue, Matteannexet, and will be open:

Tuesday	09.30-17.00
Wednesday	09.00-16.00

Emergency
Emergency number is 112. This number will connect you to police, ambulance, or fire department. The emergency number does not require an area code and the phone call is free.

Internet / WiFi
At the conference venue you will be able to access wireless internet, you will find information about this at the registration desk.

Meals
Coffee breaks, lunches and Welcome Reception on Monday 10th of March are included. They will be served in the Exhibition area.

Opening Session / Closing Session
Opening and Closing Session will take place at Kårhuset (across the street from the venue Matteannexet).
Address: Sölvegatan 22a –22e.

Parking
Nearby streets offer available parking spaces.
A parking lot is located nearby the building.

Poster sessions
Wednesday 13.00 –14.00 there will be poster sessions held downstairs from the Exhibition and Session hall entrances.

Prices
Prices in Sweden already contain value-added tax (VAT). Additional tips in the amount of 5 –10% of the bill are usual in restaurants if you are satisfied with the food

Registration desk
The registration desk at Matteannexet will be open

Monday	12.00 –20.00
Tuesday	08.00 –18.00
Wednesday	08.00 –16.00

Please contact us (Anagram Live AB) at the registration desk if you have any questions or requests and we will try to help you.

Travel/Transportation Information
Once you have arrived in Lund public transportation or walking is recommended within the city. Buses run regularly and will take you around the city. Please note that tickets can NOT be bought on the green buses, only on the yellow buses. The ticket has to be bought in advance at Skånetrafiken's customer centre (located at Malmö C and Lund C). For more information on public transport and ticket options see www.skanetrafiken.se

Bus transportation within Lund
From Clemenstorget (the square opposite Lund Central station) to Matteannexet. Green buses (city buses) and yellow buses (regional buses). On the yellow buses you are able to pay with credit-card on the bus or buy ticket at the train station.

Green buses:
Bus number 1, towards "Östra Torn
and get off at "Tunavägen-LTH".
Bus number 6, towards "Linero Centrum",
get off at "Kårhuset".
Bus number 21, towards "Brunnshög",
get off at "Kårhuset".

Yellow buses:
Bus number 160, 166, 169
From Lund Clemenstorget – Lund LTH
Get off at Lund LTH.

Taxi
At Lund central station, taxi area is located right outside. To call a taxi from another place, phone +46–(0)46-330 330 Taxi Skåne or +46–(0)46-121212 Taxi Lund

Tutorials
All tutorial sessions are held at Matteannexet Monday 10 March 14.00–17.45. Coffee break is included.

Voltage
The **voltage** in Sweden is 220 V, 50 Hz. Round"European" two-pin plugs and sockets are used.

Water
The **tap water** in Lund is safe to drink and has a good taste.

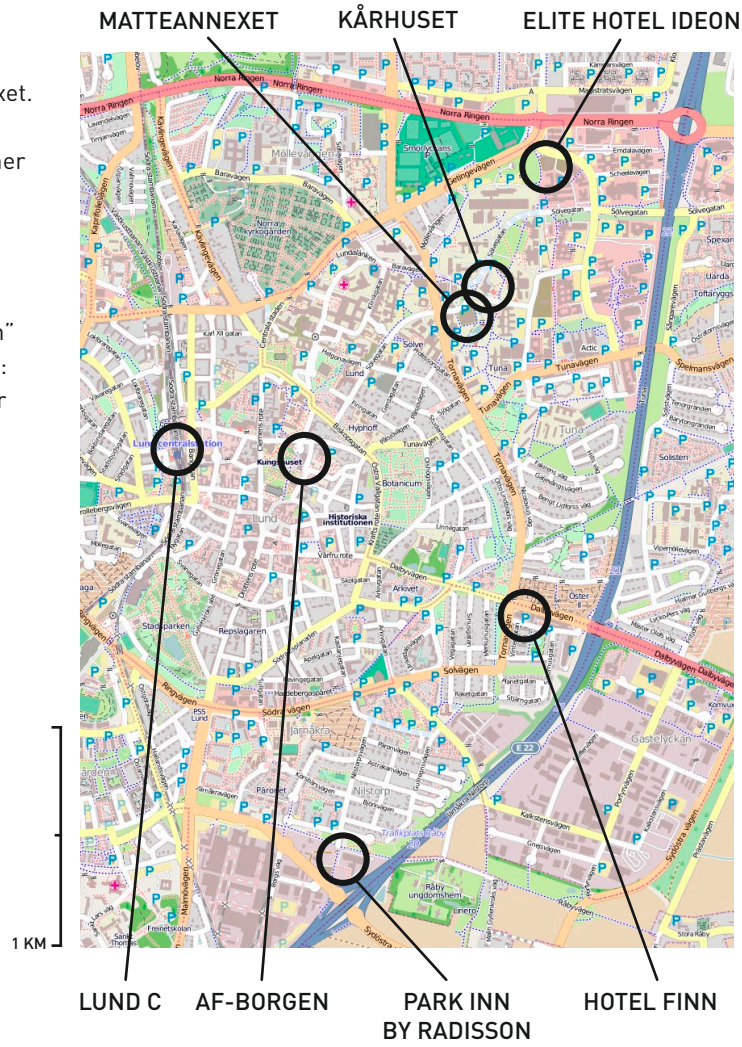
SOCIAL PROGRAM

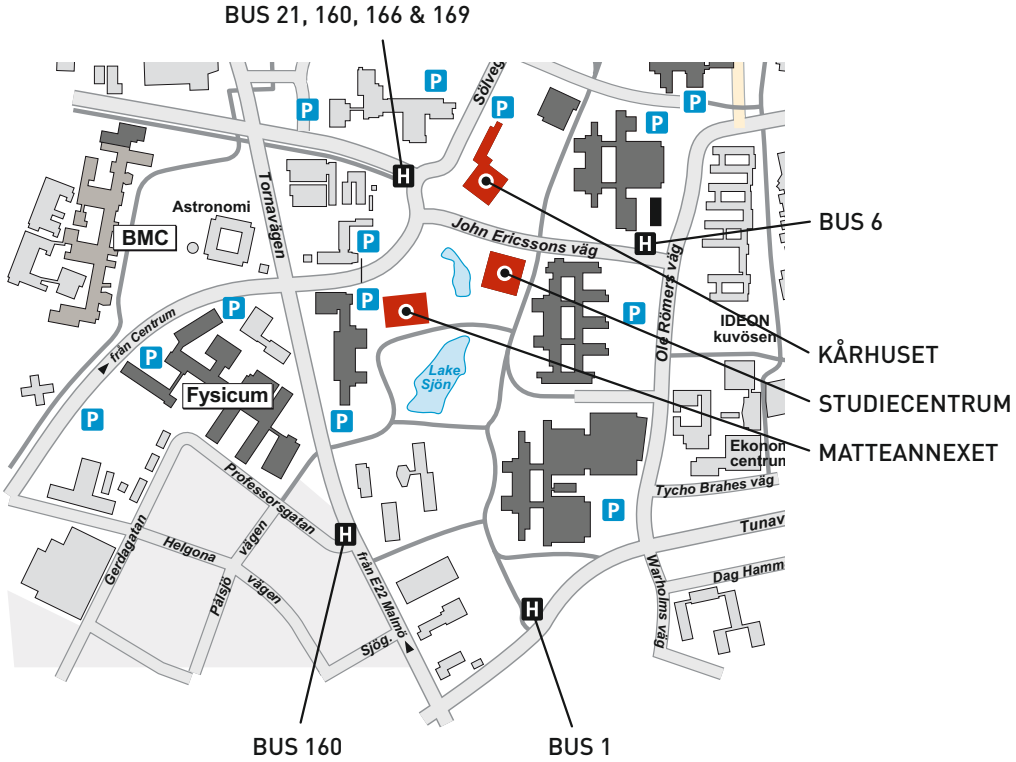
Welcome Reception March 10 th 18.00 –20.00 at Matteannexet (Center for Mathematical Sciences)
The Welcome Reception will take place at Matteannexet. Address: Sölvegatan 20A. The reception will include refreshments and canapées. Please note that no dinner is served.

Conference Dinner March 11 th 19.00 at AF Borgen (including bus shuttle)
The Conference Dinner will take place in "Stora Salen" at AF Borgen in the very City Centre of Lund. Address: Sandgatan 2. You will enjoy a nice three course dinner with wine followed by entertainment.

Bus shuttle to the Conference Dinner from 18.15.
Shuttle buses will take you from Matteannexet to the Conference Dinner at AF Borgen. The shuttle starts at 18.15.
For delegates that are booked on the recommended hotels (see below) we also offer bus shuttle back from the Conference Dinner at 23.15, leaving from Sandgatan 2, just outside AF Borgen.

1. **Elite Hotel Ideon**
2. **Hotel Finn**
3. **Park inn by Radisson**





EXHIBITORS

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IPG AUTOMOTIVE

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LMS A Siemens Business
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GOLD SPONSORS

The Conference is organized by Modelon in collaboration with the Linnaeus center LCCC at Lund University in cooperation with the Modelica Association.