

Monday, Sept 3, 2012

Modelica Tutorial at Modelica'2012 Conference

Introduction to Modeling, Simulation, and Parallel Computing with Modelica using OpenModelica

Hands-on exercises using OpenModelica—Bring Laptop!
Short introduction to the new Python scripting API also included.

The tutorial has the following goals

- Introducing the concepts of physical modeling, object-oriented modeling and component-based modeling and simulation.
- Demonstrating modeling examples from several application areas.
- Providing opportunity for hands-on exercises with the OpenModelica open-source implementation of Modelica and a graphic user interface
- Providing insight in modeling and compiling Modelica models for multi-core architectures including hands-on exercises.

Tutorial Content

The first part of the tutorial part gives an introduction to the Modelica language to people who are familiar with basic programming concepts but do not have a previous background in Modelica. It gives a basic introduction to the concepts of object-oriented modeling and simulation with Modelica, component-based modeling using graphical tools, using the Modelica Standard Library, and an overview of modeling and simulation in a number of application areas, and hands-on exercises.

The second part presents theoretical background on parallelism including the OpenMP & OpenCL standards and methods how multi-core CPU and GPU computational power can be used for efficient simulation of Modelica models. Topics include automatic parallelization of equation-based models; coarse-grained explicit parallelization based on explicit partitioning of models into sub-models; and explicit algorithmic parallel Modelica programming based on the OpenCL standard with parallel loops, parallel variables, parallel functions and kernel functions, and variables located at three different levels in the multi-core architecture memory hierarchies. Several examples and exercises will be given. The user can try it on multiple cores on his/her own laptop.

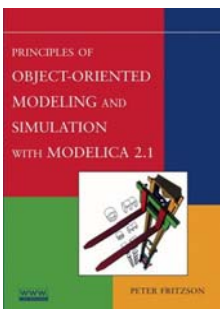
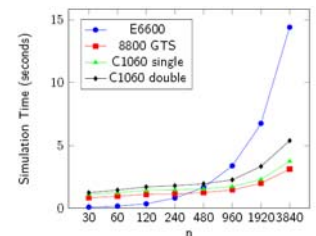
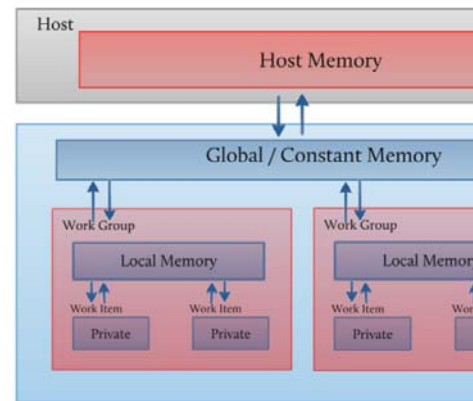
Depending on the attendees, the two workshop parts will be organized in parallel in the same room, where the first part is aimed at Modelica beginners, and the second part is for people who already know Modelica and are interested in efficient Modelica simulation on multi-cores.

Lecturers

Peter Fritzon is a Professor and Research Director of the Programming Environment Laboratory (Pelab), at the Department of Computer and Information Science, Linköping University, Sweden. He is director of the Open Source Modelica Consortium and vice chairman of the Modelica Association.

Olena Rogovchenko (PhD) is researcher at Pelab,

Martin Sjölund, **Mahder Gebremedhin**, and **Kristian Stavåker** are PhD students at Pelab with special interest in Modelica compilation to multi-core and parallel computing. They have implemented the parallel support in OpenModelica.



The tutorial is based on Peter Fritzon's book:

Principles of Object-Oriented Modeling and Simulation with Modelica 2.1

ISBN: 0-471-47163-1
Paperback, 940 pages
February 2004, Wiley-IEEE Press

Useful Links

The OpenModelica website for download:
www.openmodelica.org

Peter Fritzon's big 2003 book, 940 pages:

Principles of Object-Oriented Modeling and Simulation with Modelica 2.1

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0471471631.html>

Peter Fritzon's introductory 2011 book, 260pp:

Introduction to Modeling and Simulation of Technical and Physical Systems with Modelica
<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-111801068X.html>