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# FEniCS'12: High-performance PDE frameworks for modern architectures - June 5-7, 2012

We are pleased to announce this year's edition of the annual FEniCS workshop: **FEniCS'12: High-performance PDE frameworks for modern architectures June 5 – 7, 2012 at Simula Research Laboratory, Oslo, Norway.** All FEniCS users, developers and other interested parties are invited to celebrate the recent release of FEniCS 1.0 and the FEniCS Book, and to discuss future directions for FEniCS development. A half-day FEniCS tutorial will be offered as part of the workshop. Participation in the workshop and tutorial is free of charge.

## FEniCS'12 at Simula Research Laboratory, June 5 – 7

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### FEniCS'12: High-performance PDE frameworks for modern architectures June 5 – 7, 2012

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We have open slots for contributed talks: if you are interested in presenting your recent work, please email a title and a short abstract to Marie Rognes (meg@simula.no) by May 1, 2012.

To register for the workshop, please contact Marie Rognes (meg@simula.no) by May 15, 2012.

## Workshop abstract

Generic software frameworks play an increasingly important role in the numerical solution of partial differential equations. When new hardware architectures are introduced, these software frameworks must adapt to leverage the computational power of the new hardware and to match the performance of specialized hand-written code.

This workshop aims to bring together experts on generic software for partial differential equations and high performance computing on modern architectures. Topics include

- User-friendly programming tools for many-core CPUs and GPUs
- Automated code translation and generation targeting modern hardware
- Hybrid computing using both CPUs and GPUs
- Innovative PDE software techniques
- Free/open-source software for numerical solution of PDEs

### Invited speakers:

- Scott Baden
- Andre Brodtkorb
- Carsten Burstedde
- Filipe Cruz
- Paul Kelly
- Ridgway Scott
- Andy Terrell
- Garth Wells

Total number of participants: 46  
 Total number of guests outside of CBC: 21  
 Number of different nationalities represented: 7  
 Total number of speakers: 19  
 Total number of talks: 19

## Program

### Tuesday June 5

Location: "Storstua" @ Simula Research Laboratory

09:00 - 13:00 Registration (in Simula reception)  
 09:30 - 12:00 "FEniCS Tutorial" by Anders Logg

#### Session 1: Chair: Anders Logg

13:00 - 13:15 "Welcome" by Anders Logg  
 13:15 - 14:00 "Easy HPC" by Garth Wells  
 14:00 - 14:45 "Generating programs work better than transforming them, if you get the abstraction right" by Paul H. J. Kelly  
 14:45 - 15:00 Break

#### Session 2: Chair: Xing Cai

15:00 - 15:45 "Design of optimal Runge-Kutta methods" by David Ketcheson

15:45 - 16:15 *Break*

16:15 - 16:40 "Generating high-performance multi platform FEM solvers using Manycore Form Compiler and OP2" by Graham Markall

16:40 - 17:05 "An embedded language for vector operations via OpenCL" by Brian Brennan

17:05 - 17:30 "Algorithms for efficient compilation of complicated forms" by Martin S. Alnæs

## Wednesday June 6

**Location: "Storstua" @ Simula Research Laboratory**

### Session 3: Chair: Hans Petter Langtangen

10:00 - 10:45 "High-performance heterogeneous CPU-GPU computing on DEGIMA cluster" by Felipe Cruz

11:00 - 11:45 *TBA* by Andy Ray Terrel

12:00 - 13:00 *Lunch*

13:00 - 13:45 "Modular forest-of-octrees AMR: algorithms and interface" by Carsten Burstedde

13:45 - 14:30 "Scalable solution of non-linear time-dependent systems" by L. Ridgway Scott

14:30 - 14:45 *Break*

### Session 4: Chair: Marie E. Rognes

14:45 - 15:10 "libadjoint: a new abstraction for developing adjoint models" by Simon Funke

15:10 - 15:35 "dolfin-adjoint: automating the adjoints of DOLFIN models" by David A. Ham

15:35 - 16:00 "GenFoo: a general Fokker-Planch solver with applications in fusion plasma physics" by Josef Höök

16:00 - 16:30 *Break*

16:30 - 16:55 "Nitsche's method for fictitious domains and overlapping meshes: analysis and implementation" by Andre Massing

16:55 - 17:20 "The surprise talk" by Kent-Andre Mardal

**19:00 - Dinner**

## Thursday June 7

**Location: "Bakrommet" @ Simula Research Laboratory**

### Session 5: Chair: Xing Cai

09:30 - 10:15 "Compact stencils for shallow water equations on graphics processing units" by Andre R. Brodtkorb

10:15 - 11:00 "Computing at a million laptops per second" by Scott Baden

11:00 - 11:15 *Break*

11:15 - 12:00 "Auto-generating optimized CUDA for stencil computation" by Didem Unat

12:00 - 12:15 *Closing remarks*

### Organizing committee:

Anders Logg  
Marie Rognes  
Xing Cai

### Registration

By email to Marie Rognes (meg@simula.no) by May 15.

More information on the workshop can be found on the FEniCS webpage:

[http://fenicsproject.org/featured/2012/fenics\\_12\\_simula.html](http://fenicsproject.org/featured/2012/fenics_12_simula.html)

### Useful information for guests at CBC:

<http://cbc.simula.no/pub/guestlist.html#usefulinfo4guests>

<b>What</b>	▪ Workshop
<b>When</b>	Jun 05, 2012 10:00 AM to Jun 07, 2012 04:00 PM
<b>Where</b>	Simula
<b>Contact Name</b>	Marie Rognes
<b>Attendees</b>	Amir Masoud Abdol Anders E. Johansen Anders Logg Andre Brodtkorb Andre Massing Andy Terrel Aron Ahmadi Bernardo L. deOliveira Brian Brennan Daniele Tartarini David Ham Didem Unat Eline Sundt Felipe Cruz Florian Rathgeber Fredrik Valdmanis Gabrial Balaban Garth Wells Glenn T. Lines Graham Marrkall Hans Petter Langtangen Ida Norderhaug Drosdal Joachim Berdal Haga

	Johan Hake Johannes Ring Josef Höök Jussi Koivumäki Kent-Andre Mardal Lyuda Vynnytska Marie E. Rognes Martin Alnæs Matteo Brunetti Mikael Mortensen Molly Maleckar Myles English Paul Kelly Rainer Nerlich Ridgway Scott Roberto Alessi Scott Baden Simon Funke Xing Cai
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