

# Introduction to High Performance Computing

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EPSRC

NERC SCIENCE OF THE ENVIRONMENT



CRAY  
THE SUPERCOMPUTER COMPANY

epcc



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# Course Parameters

- Pre-requisites
  - None, this course is designed for everyone, from computing novices upwards, to be able to participate in and complete
- Hands-on practicals form an integral part of the course.
  - We will help with these, and do not expect any programming experience of attendees (although you're free to dive into the programs if you have more computing experience)



# Aims

- Why do people use HPC?
- What do people use HPC for?
- Understanding of computer hardware
  - Which parts matter for performance in modelling and simulation?
- Understanding of processes and threads
- Understanding of parallel programming models
- How to interact with a HPC resource
- Knowledge of current HPC architectures
- Knowledge of current parallel programming libraries
- Appreciation of the future of HPC



# Timetable

## Day 1

09:30 Welcome, Overview and Syllabus  
09:45 LECTURE: Why learn about HPC?  
10:15 LECTURE: Image sharpening  
10:30 PRACTICAL: Sharpen example  
11:00 BREAK: Coffee  
11:30 LECTURE: Parallel Programming  
12:15 PRACTICAL: Sharpen (cont.)  
13:00 BREAK: Lunch  
14:00 LECTURE: Building Blocks  
(CPU/Memory/Accelerators)  
14:30 LECTURE: Building Blocks  
(OS/Process/Threads)  
15:00 LECTURE: Fractals  
15:10 PRACTICAL: Fractal example  
15:30 BREAK: Tea  
16:00 LECTURE: HPC Architectures  
16:45 PRACTICAL: Fractals (cont.)  
17:30 CLOSE

## Day 2

09:30 LECTURE: Parallel programming  
models  
10:15 LECTURE: Batch systems  
10:45 PRACTICAL: Computational Fluid  
Dynamics (CFD)  
11:00 BREAK: Coffee  
11:30 PRACTICAL: CFD (cont.)  
12:30 LECTURE: Compilers  
13:00 BREAK: Lunch  
14:00 PRACTICAL: Compilers (CFD cont.)  
14:30 LECTURE: Parallel Libraries  
15:00 LECTURE: Future of HPC  
15:30 BREAK: Tea  
16:00 LECTURE: Summary  
16:15 PRACTICAL: Finish exercises  
17:00 CLOSE



# Course materials

- Everything online:
  - Slides, exercise notes, code to use

`http://www.archer.ac.uk/training/courses/2014/12/2dayhandson\_southampton/`



# Support

- Helpdesk
  - Email [support@archer.ac.uk](mailto:support@archer.ac.uk)
  - via ARCHER SAFE <http://www.archer.ac.uk/safe>
  - phone: +44 (0)131 650 5000
  - By post, to: Liz Sim  
EPCC  
University of Edinburgh  
JCMB  
The King's Buildings  
Mayfield Road  
EDINBURGH EH9 3JZ
- <http://www.archer.ac.uk/community/techforum/>



# Training opportunities

- ARCHER Training (free to academics):
  - <http://www.archer.ac.uk/training/>
  
- EPCC MSc in HPC
  - <http://www.epcc.ed.ac.uk/msc/>





# Funding calls

- Embedded CSE support
  - Through a series of regular calls, Embedded CSE (eCSE) support provides funding to the ARCHER user community to develop software in a sustainable manner for running on ARCHER. Funding will enable the employment of a researcher or code developer to work specifically on the relevant software to enable new features or improve the performance of the code
  - Apply for funding for development effort
  - Fourth call opened 25<sup>th</sup> November 2014
  - Closes on 13<sup>th</sup> January 2015
  - Happen every 4 months
- See <http://www.archer.ac.uk> for details



# Feedback and follow-up

- <http://www.archer.ac.uk/training/feedback/>
- Virtual Tutorials
  - Online every second Wednesday of the month
  - <http://www.archer.ac.uk/training/virtual/>

