

# 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



# ARCHER Driving Test

- [https://www.archer.ac.uk/training/course-material/online/driving\\_test.php](https://www.archer.ac.uk/training/course-material/online/driving_test.php)
- an on-line assessment tool which allows those new to ARCHER to demonstrate that they are sufficiently familiar with ARCHER and HPC to start making use of it.
- suitable for anyone who has completed a [Hands-On introduction to HPC ARCHER training course](#), or for users of other HPC systems who have familiarised themselves with the specifics of running jobs on ARCHER by reading up the [online Introduction to ARCHER](#) resources.
- On successful completion of the Driving Test, you will be invited to apply for an account and awarded an allowance of 1200 kAUs (80,00 CPU hours) to use to run jobs over a period of up to 12 months.



# 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: Parallel programming  
models  
16:45 PRACTICAL: Fractals (cont.)  
17:30 CLOSE

## Day 2

09:30 LECTURE: HPC Architectures  
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/course-material/2015/07/intro\\_epcc/](http://www.archer.ac.uk/training/course-material/2015/07/intro_epcc/)



# 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: Anne Whiting  
EPCC  
University of Edinburgh  
JCMB  
The King's Buildings  
Mayfield Road  
EDINBURGH EH9 3JZ





# Training opportunities

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



# 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
  - Sixth call expected to open 4<sup>th</sup> August 2015
  - Closes on 15<sup>th</sup> September 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 at 15:00
  - <http://www.archer.ac.uk/training/virtual/>
- Technical webinars at the same URL
  - usually also on Wednesday afternoons

