

Hands-on Introduction to High Performance Computing

Overview of Course

EPSRC

NERC SCIENCE OF THE ENVIRONMENT

 **archer**

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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 - 09.45 L01 Welcome

09.45 - 10.15 L02 Why HPC

10:15 - 10:30 L03 Sharpen exercise

10:30 - 11.00 PRACTICAL Sharpen

11:00 - 11.30 COFFEE

11:30 - 12:15 L04 Parallel Programming

12:15 - 13:00 PRACTICAL Sharpen

13.00 - 14.00 Lunch

13:00 - 14.00 L05 Building Blocks 1: CPU/Memory/Accelerator

14.30 - 15.00 L06 Building Blocks 2: OS/Process/Threads

15:00 - 15:10 L07 Fractals exercise

15:10 - 15:30 PRACTICAL: fractals

15.30 - 16.00 TEA

16:00 - 16:45 L08 HPC Architectures

16:45 - 17:30 PRACTICAL: Fractals (contd)



Timetable: Day 2

09:30 - 10:15 L09 Parallel programming models
10:15 - 10:45 L10 Batch systems
10.45 - 11.00 L11 CFD example
11.00 - 11.30 TEA
11.30 - 12.30 PRACTICAL CFD (cont)
12.30 - 13.00 L12 Compilers
13:00 - 14:00 LUNCH
14:00 - 14:30 PRACTICAL - compilers (CFD contd)
14:30 - 15:00 L13 Parallel Libraries
15:00 - 15:30 L14 Future of HPC
15:30 - 16:00 TEA
16:00 - 16:15 L15 Summary
16.15 - 17.30 Finish practicals



Course materials

- Everything online:
 - Slides, exercise notes, code to use
- URL given in your login sheet
- <http://www.archer.ac.uk/training/course-material/...>



Feedback and follow-up

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





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EPCC's PRACE Advanced Training Centre



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Six PRACE Advanced Training Centres (PATCs)

Hubs for world-class HPC training for researchers in Europe

www.training.prace-ri.eu

- Barcelona Supercomputing Center (Spain)
- CINECA - Consorzio Interuniversitario (Italy)
- CSC - IT Center for Science Ltd (Finland)
- EPCC at the University of Edinburgh (UK)
- Gauss Centre for Supercomputing (Germany)
- Maison de la Simulation (France)

EPCC's PATC

- EPCC runs the UK National Supercomputer ARCHER
 - Cray XC30, a tier-1 resource in PRACE



- A long history of HPC training
 - one-year Masters course in High Performance Computing since 2001
 - www.epcc.ed.ac.uk/msc/
 - a number of scholarships available this year

PRACE support

- PRACE also funds catering and other expenses for PATC courses
- Upcoming courses (at EPCC and throughout Europe)
 - www.archer.ac.uk/training/
 - www.training.prace-ri.eu
- Please fill in the course feedback form!
 - see www.archer.ac.uk/training/feedback/
 - opens on last day of course