Introduction to High Performance Computing

Reusing this material

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

- 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/2016/07/intro_epcc/

Documentation

- See http://www.archer.ac.uk/documentation/

- The Quick Start Guide at
  https://www.archer.ac.uk/support/getting-started/ is a good
  place to start.

Support

- Helpdesk
  - Email 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 4th August 2015
  - Closes on 15th September2015
  - 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