INTRODUCTION TO THE ARCHER KNIGHTS LANDING CLUSTER

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Intel's IPCC program

- Collaboration between Intel and leading Universities around the world
- "Intel® Parallel Computing Centers are universities, institutions, and labs that are leaders in their field, focusing on modernizing applications to increase parallelism and scalability through optimizations that leverage cores, caches, threads, and vector capabilities of microprocessors and coprocessors."

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- UK National Supercomputer Service, managed by EPSRC
  - housed, operated and supported by EPCC
  - hardware Supplied by Cray
- Training provided by the ARCHER Computational Science and Engineering (CSE) support team
  - 72 days per year at various locations round the UK
  - free to all academics

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EPCC's Advanced Computing Facility

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What is EPCC?

- UK national supercomputer centre
  - founded in 1990 (originally Edinburgh Parallel Computing Centre)
  - a self-funding Institute at The University of Edinburgh
  - running national parallel systems since Cray T3D in 1994
  - around 65 full-time staff
  - a range of academic research and commercial projects
  - one-year postgraduate masters in HPC www.epcc.ed.ac.uk/msc/
  - new online accredited courses www.epcc.ed.ac.uk/online-courses/
- Get in contact if you want to collaborate
  - many staff are named RAs on research grants
  - joint research proposals
  - European project consortia

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Key ARCHER Resources

- Upcoming courses
  - http://www.archer.ac.uk/training/
- Material from past courses
  - http://www.archer.ac.uk/training/past_courses.php
- Virtual tutorials (online)
  - http://www.archer.ac.uk/training/virtual/
- Documentation
  - http://www.archer.ac.uk/documentation/

Other Resources

- Please fill in the feedback form!
  - http://www.archer.ac.uk/training/feedback/
- General enquiries about ARCHER go to the helpdesk
  - support@archer.ac.uk
- EPCC runs one-year taught postgraduate masters courses
  - ***MSc in HPC*** and ***MSc in HPC with Data Science***
  - awarded by the University of Edinburgh since 2001
  - scholarships available
  - http://www.epcc.ed.ac.uk/msc/

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MSc in HPC / HPC with Data Science

- taught by EPCC staff (plus options in Informatics, Maths, Physics, ...)
- 12 taught courses (8 months); research dissertation (4 months)

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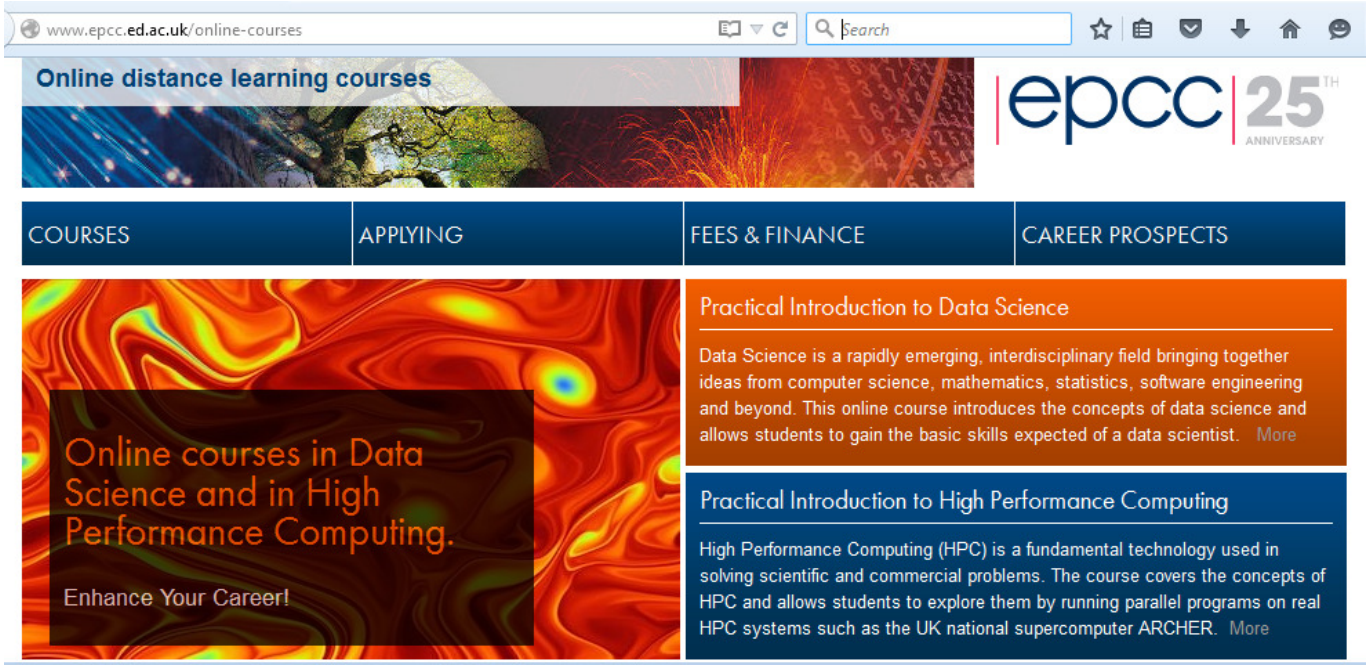
Online accredited courses



- Run from January to May
  - entirely online: www.epcc.ed.ac.uk/online-courses/.
  - each course is 20 credits (c.f. a 180-credit MSc)

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Access to ARCHER (during course)

- Guest accounts for duration of course
  - should only be used in the classroom
- Accounts will be closed immediately after the course
  - all files etc will be deleted
- Take copies of all your work before course ends!
- Course materials (slides, exercises etc) available from course web page
  - archived on ARCHER web pages for future reference

Access to ARCHER (longer term)

- Various ways to apply for time on ARCHER
  - see http://www.archer.ac.uk/access/
- All require justification of resources
  - Instant Access has the lowest barrier to entry
  - designed for exploratory work, e.g. in advance of a full application
- Or take the “ARCHER Driving Test”
  - www.archer.ac.uk/training/course-material/online/driving_test.php
  - successful completion allows you to apply for an account for 12 months with an allocation of around 80,000 core-hours
  - backed up by online training materials
  - www.archer.ac.uk/training/course-material/online/

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)

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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

Course Parameters

- Pre-requisites
  - Some level of C or Fortran programming knowledge
- Hands-on practicals form an integral part of the course.
  - We will help with these

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Aims

- On completion of this course attendees should:
  - Understand the Knights Landing (KNL) processor.
  - Understand how to access and run jobs on the ARCHER KNL cluster
  - Use the different memory available in the nodes.
  - Understand the impact of vectorisation on performance on KNL.
  - Understand how to check how well an application is vectorising and to modify applications to improve vectorisation

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Course materials

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

https://www.archer.ac.uk/training/course-material/2017/04/KNL_Leeds/index.php

Timetable – Day 1

- 09.30 Course Introduction
- 09.45 Introduction to the KNL processors and ARCHER KNL cluster
- 10.45 Break
- 11.15 Hands-on: Running on the ARCHER KNL
- 12.00 Memory modes programming
- 12.30 Lunch
- 14.00 Hands-on: Investigating Memory modes
- 15.00 Cluster modes
- 15.30 Coffee
- 16.00 Vectorisation
- 17.00 Finish

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Timetable – Day 2

- 09.30 Vectorisation recap
- 09.45 Hands-on: Vectorisation
- 11.00 Coffee
- 11:30 Serial Optimisation
- 12.30 Lunch
- 14.00 Hands-on: Serial optimisation
- 15.30 Coffee
- 16.00 Hands-on: Continue practicals or bring your own code
- 17.00 Finish

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