Shared Memory Programming with OpenMP

Overview

Reusing this material

- 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

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/
- Get in contact if you want to collaborate
  - many staff are named RAs on research grants
  - joint research proposals
  - European project consortia
  - ...

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/

- Technical forum (online)
  - http://www.archer.ac.uk/community/techform/

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

Who am I?

Mark Bull markb@epcc.ed.ac.uk

- Senior researcher at EPCC
    - Interests in parallel algorithms, parallel programming models, benchmarking, novel uses of HPC
- Lecture on EPCC's MSc in HPC
- EPCC's representative on the OpenMP ARB

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/

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)

Access to ARCHER

- Guest accounts for duration of course
  - can be used in the evenings while the course is running

- 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

Timetable – Day 1

- 0930 –1100 Lectures - Shared Memory Concepts, OpenMP Fundamentals, Parallel Regions
- 1100 - 1130 Coffee
- 1130 - 1300 Practical – Hello World; Mandelbrot 1
- 1300 - 1400 Lunch
- 1400 - 1530 Lectures - Work sharing, Synchronisation
- 1530 - 1600 Coffee
- 1600 - 1730 Practical - Mandelbrot 2, Molecular Dynamics

Timetable – Day 2

- 0930 –1100 Lectures - Further topics, OpenMP Tasks
- 1100 - 1130 Coffee
- 1130 - 1300 Practical - MD with orphaning, Mandelbrot with tasks
- 1300 - 1400 Lunch
- 1400 - 1530 Lectures - Memory model, Performance tuning
- 1530 - 1600 Coffee
- 1600 - 1730 Practical - MD tuning

Lecture notes etc.

Go to

http://www.archer.ac.uk/training

and follow the links

Practical exercises source code

To download the source code for the practical exercises, make sure you are in your `work` directory on ARCHER

```
cd /work/y14/y14/guestXX/
```

Then use the following commands:

```
cp /home/z01/shared/OMP-exercises.tar .
tar xvf OMP-exercises.tar
```