



EPSRC

Threaded programming

Overview



Reusing this material



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

http://creativecommons.org/licenses/by-nc-sa/4.0/deed.en_US

This means you are free to copy and redistribute the material and adapt and build on the material under the following terms: You must give appropriate credit, provide a link to the license and indicate if changes were made. If you adapt or build on the material you must distribute your work under the same license as the original.

Note that this presentation contains images owned by others. Please seek their permission before reusing these images.





- 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)



Timetable – Day 1

- 09:00 Lectures: Shared Memory Concepts; OpenMP Fundamentals; Parallel Regions
- 11:00 Break
- 11:30 Exercises: Hello World; Parallel regions
- 13:00 Lunch
- 14:00 Lectures: Work sharing; Synchronisation
- 15:30 Break
- 16:00 Exercises: Parallel loops; Synchronisation
- 17:00 Close



Timetable – Day 2

- 09:00 Lectures: Further topics; OpenMP Tasks
- 11:00 Break
- 11:30 Exercises: Synchronisation; Orphaning
- 13:00 Lunch
- 14:00 Lectures: Memory model; Other threading models
- 15:30 Break
- 16:00 Exercise: Tasks
- 17:00 Close



Timetable – Day 3

- 09:00 Lectures: Computer architecture: processors, memory, parallel systems
- 11:00 Break
- 11:30 Lectures: Sequential optimisation techniques
- 13:00 Lunch
- 14:00 Lectures: Multithreaded optimisation
- 15:30 Break
- 16:00 Exercise: Multithreaded optimisation
- 17:00 Close



Lecture notes etc.

http://www.archer.ac.uk/training/course-material/2015/03/thread_prog/

...or go to

<http://www.archer.ac.uk/training>
and follow the links!



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



Logging on to ARCHER

You will have been given a guest account ID – referred to generically here as guestXX - and a password.

These credentials can be used to access ARCHER using

```
ssh -X guestXX@login.archer.ac.uk
```

or with the SSH client of your choice (-X ensures that graphics are routed back to your desktop).



Practical exercises source code

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

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

