

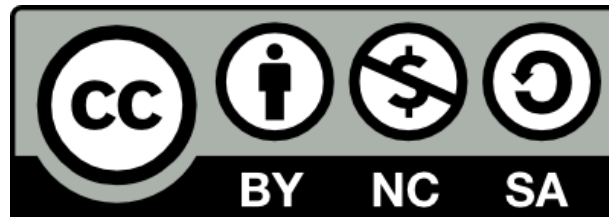


Advanced OpenMP

Overview



Reusing this material



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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



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

- 09:00 Lectures: OpenMP basics: Parallel regions, Worksharing, Synchronisation
- 11:00 COFFEE
- 11:30 Practical: Parallel regions
- 13:00 LUNCH
- 14:00 Lectures: Multicore and multithreaded CPUs, Caches, Cache coherency, NUMA
- 15:30 COFFEE
- 16:00 Practicals: Streams, Coherency
- 17:00 CLOSE



Timetable – Day 2

- 09:00 Lectures: Tasks, Nested parallelism, Memory model
- 11:00 COFFEE
- 11:30 Practicals: Mandelbrot with nested loops, collapse, and tasks
- 13:00 LUNCH
- 14:00 Lectures: OpenMP + MPI
- 15:30 COFFEE
- 16:00 Practicals: OpenMP + MPI
- 17:00 CLOSE



Timetable – Day 3

- 09:00 Lectures: OpenMP tips, tricks and pitfalls, Performance issues
- 11:00 COFFEE
- 11:30 Practicals: MD tuning
- 13:00 LUNCH
- 14:00 OpenMP 4.0 features, alternative APIs
- 15:30 COFFEE
- 16:00 Consultancy session: bring your own code!
- 17:00 CLOSE



Lecture notes etc.

go to

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

and follow the links!



Logging on to ARCHER

- Use Putty or ssh to connect to

login.archer.ac.uk

- Use guest account on your form (guestXX)
- Password on timetable sheet



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/advomp.tar .
```

To submit a batch job use:

```
qsub -q Rnnnnnn myscript.pbs
```

where *nnnnnn* is the reservation ID for the day, on the timetable sheet

