JSC OpenACC Course 2016

Andreas Herten, Forschungszentrum Jülich, 24 October 2016

Welcome!

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Welcome to OpenACC course 2016!

Jülich Supercomputing Centre

JÜLICH
FORSCHUNGSZENTRUM

- Forschungszentrum Jülich
- Part of Institute of Advanced Simulation (IAS)
- Operates supercomputers and connected infrastructure
- Researches in next generation
- Supports applications leveraging machines
- Supercomputers
  - JUQUEEN
  - JURECA
  - DEEP
  - JURON/JULIA
  - Former: JUROPA, JUGENE, JUDGE

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JURECA

- #57 in TOP500 list (2015: #49)
- 1872 nodes (Intel Haswell CPUs, 2 $\times$ 12 cores)

$\hookrightarrow$ 75 nodes with 2 NVIDIA K80 GPUs
(each 2 $\times$ 2496 CUDA cores, 2 $\times$ 12 GB memory)

OpenACC Course

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- Since 2014
- There are other *many-core* courses
  - CUDA: 24.4.2017
  - OpenCL: 16.3.2017

OpenACC Course

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- Since 2014
- There are other *many-core* courses
  - CUDA: 24.4.2017
  - OpenCL: 16.3.2017
- Tutors of this course

Paul Baumeister
POWER Acceleration and Design Centre, JSC

Andreas Herten
NVIDIA Application Lab at Jülich, JSC

Jiri Kraus
NVIDIA Application Lab at Jülich, NVIDIA

Anne Severt
JSC, Division Civil Security & Traffic

Timetable

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Hands-on

Day 1

- Introduction to GPU/ Parallel Programming
  Paul Baumeister
- OpenACC Programming Model I
  Anne Severt
- Morning Break (10:30 - 10:45)
- Tools for Debugging and Profiling H
  Andreas Herten
- Lunch Break (12:30 - 13:30)
- OpenACC Programming Model II H
  Anne Severt
- Afternoon Break (15:00 - 15:30)
- Performance Optimization H
  Jiri Kraus

Day 2

- Recap Day 1
  Jiri Kraus
- Performance Optimization (Cont.)
  Jiri Kraus
- Morning Break
- Interoperability of OpenACC with CUDA and GPU-enabled Libraries H
  Andreas Herten
- Lunch Break
- Multi-GPU Programming with MPI H
  Jiri Kraus
- Afternoon Break
- Multi-GPU Programming with MPI (Cont.)
  Jiri Kraus

Organizationals

- Please sign Attendance List!
- Morning/afternoon breaks: Coffee machine around the corner and upstairs
- Lunch breaks: In canteen (*Casino*)
  - Need to buy payment cards on machine
  - Use machine with slot for entering cards, they provide Guest Cards!
  - 5 € deposit needed, returned when returning card on Tuesday
  - Participants from FZJ will surely help you!
- Interactive course!
  Lots of hands-on in different tasks!

More Technicalities

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- Infrastructure for tasks
  - Each person has login: `train002` - `train020`
  - Login valid for local computers **and** JURECA
  - Password given on sheet of paper, valid for login and SSH key
- Tasks
  - Tasks are in `openacc` directory of JURECA
  - Sorted by session, programming language, task number
  - Solutions are always given, you decide how long you tinker before peaking into solutions
    (Hint: The later, the more benefit you will get from this course!)
  - There's a cheat sheet for JURECA
- Compilers
  - OpenACC only supported by compilers from PGI and Cray, some support in GCC
  - We will use compiler from PGI, already installed (and licensed) on JURECA
  - Personal use: Trial version available on `www.pggroup.com`

Let's Get Started!

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Questions?