

HiPerCH Workshop

8.--11. April 2013



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High Performance Computing Hessen

- The new System at TU Darmstadt
- Parallelization: MPI, OpenMP, CUDA and OpenAcc
- Accelerators GPU and Xeon Phi
- Programming/Development Tools
- Tuning

Program



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	Monday 08 April 2013	Tuesday 09 April 2013	Wednesday 10 April 2013	Thursday 11 April 2013
9:00-10:30		Dr. Markus Geimer, JSC, FZ Jülich - Challenges of the Exascale era - and how tools can help (45min)	Prof. Dr. Gabriel Wittum, Goethe University Frankfurt - Parallel Adaptive Simulation of Processes from Science and Engineering	Prof. Dr.-Ing. Andreas Koch, TU Darmstadt - Matching the Architecture to the Application: Reconfigurable Computing (45min)
		Tutorial MPI Programming for Beginners - Christian Iwainsky, TU Darmstadt (45min)	Dr. Michael Klemm, INTEL - Introduction into the Intel XEON Phi co-processor (45min)	Tutorial CUDA - GPU Programming I - Prof. Dr.-Ing. Michael Goesele, TU Darmstadt (45min)
10:30-11:00	Welcome - Prof. Dr. Christian Bischof Workshop Overview - Dr. Andreas Wolf	coffee break	coffee break	coffee break
11:00-12:30	Prof. Dr. Christian Bischof, TU Darmstadt - Software in High-Performance Computing (45min) Prof. Dr.-Ing. Johannes Janicka, TU Darmstadt - Predicting Complex Turbulent Combustion Systems Using Large Eddy Simulation and Flamelet-Based Tabulated Chemistry (45min)	Tutorial MPI Programming Advanced - Dr. Sergey Boldyrev, TU Darmstadt (45min) Tutorial Parallelization Strategies - Dr. Andreas Wolf, TU Darmstadt (45min)	Tutorial OpenMP Programming - Christian Terboven, RWTH Aachen University (90min)	Tutorial CUDA - GPU Programming II - Prof. Dr.-Ing. Michael Goesele, TU Darmstadt (45min) Tutorial OpenACC - GPU Programming - Sandra Wienke, RWTH Aachen University (45min)
12:30-14:00	lunch break	lunch break	lunch break	lunch break
14:00-15:30	Introduction System Hardware - TU Environment - Karsten Kutzer, IBM Deutschland (45min) Christian Iwainsky, TU Darmstadt - An Intro to HPC Programming: Principles & Terminology (45min)	Lab MPI - Christian Iwainsky / Dr. Sergey Boldyrev / Dr. Andreas Wolf, TU Darmstadt (90min)	Lab OpenMP - Christian Terboven, RWTH Aachen University (90min)	Lab CUDA+OpenACC - André Schulz, TU Darmstadt / Sandra Wienke, RWTH Aachen University (90min)
15:30-16:00	coffee break	coffee break	coffee break	coffee break
16:00-17:30	Introduction System Software - TU Environment - Dr. Andreas Wolf, TU Darmstadt (90min)	Tool Totalview - Dr. Sergey Boldyrev, TU Darmstadt (45min) Tool Vampir - Christian Iwainsky, TU Darmstadt (45min)	Tool Intel Cluster Studio - Michael Burger, TU Darmstadt (45min) Tutorial OpenMP and Performance - Christian Terboven, RWTH Aachen University (45min)	Sandra Wienke, RWTH Aachen University - Case Study on Productivity and Performance of GPGPUs (45min) Closing remarks - Prof. Dr. Christian Bischof / Dr. Andreas Wolf
19:00 -		Social Event - Dinner		

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15:30-16:00	coffee break	coffee break	coffee break	coffee break
16:00-17:30	Introduction System Software - TU Environment - Dr. Andreas Wolf, TU Darmstadt (90min)	Tool Totalview - Dr. Sergey Boldyrev, TU Darmstadt (45min) Tool Vampir - Christian Iwainsky, TU Darmstadt (45min)	Tool Intel Cluster Studio - Michael Burger, TU Darmstadt (45min) Tutorial OpenMP and Performance - Christian Terboven, RWTH Aachen University (45min)	Sandra Wienke, RWTH Aachen University - Case Study on Productivity and Performance of GPGPUs (45min) Closing remarks - Prof. Dr. Christian Bischof / Dr. Andreas Wolf
19:00 -		Social Event - Dinner		

Rooms



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ground floor

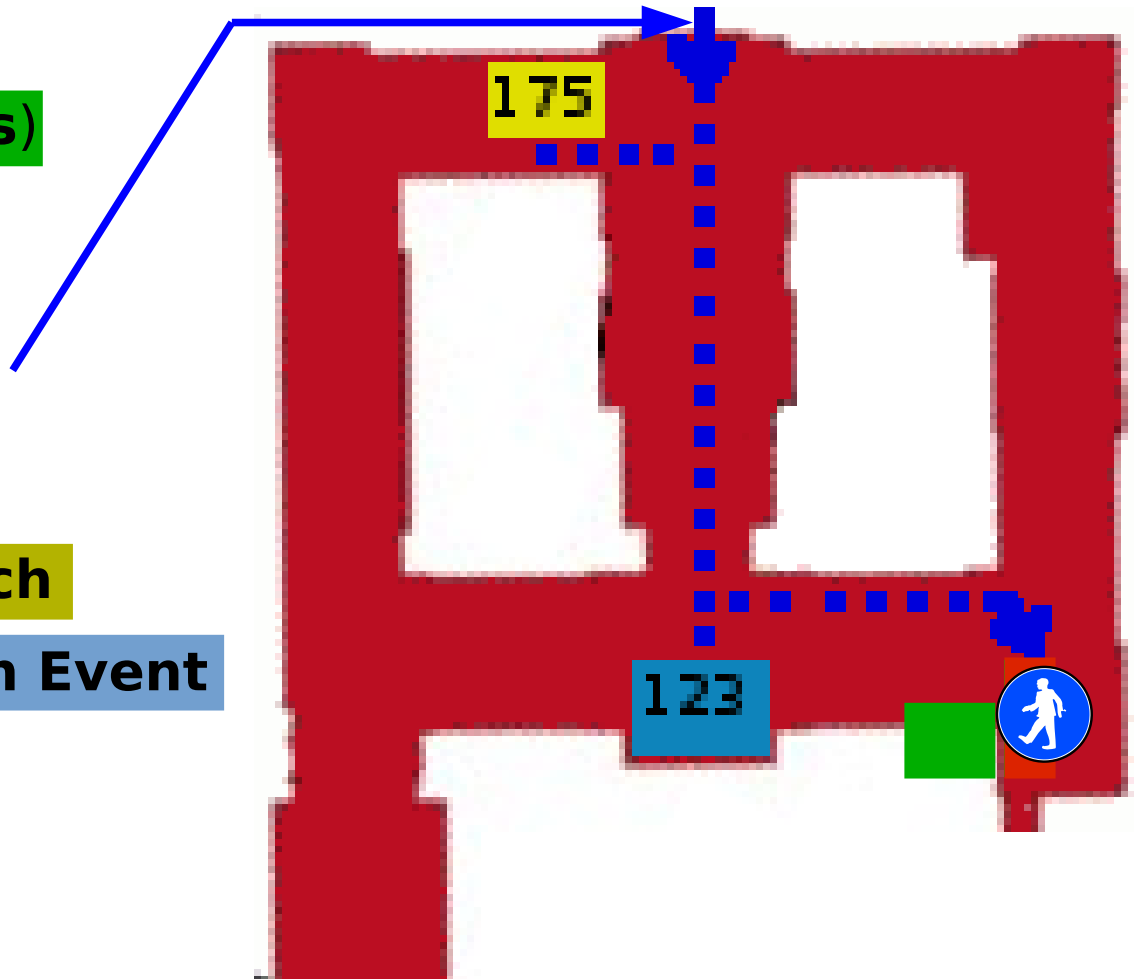
- PC-Pool S2 (**Labs**)

first floor

- **Main Entrance**

second floor

- room 175 – **Lunch**
- room 123 – **Main Event**
& *Coffee Break*



8. April - Overview of Hardware and Software



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|---------------|--|
| 10:30 – 11:00 | <ul style="list-style-type: none">• Welcome - Prof. Christian Bischof, (SC, HRZ) TU Darmstadt• Workshop Overview - Dr. Andreas Wolf, (HRZ) TU Darmstadt |
| 11:00 – 12:30 | <ul style="list-style-type: none">• Prof. Christian Bischof, (SC, HRZ) TU Darmstadt
Software in High-Performance Computing• Prof. Johannes Janicka, (EKT) TU Darmstadt
Predicting Complex Turbulent Combustion Systems Using Large Eddy Simulation and Flamelet-Based Tabulated Chemistry |
| 12:30 – 14:00 | <ul style="list-style-type: none">• Lunch |
| 14:00 – 15:30 | <ul style="list-style-type: none">• <i>Introduction:</i> System Hardware - TU Environment
Karsten Kutzer, IBM Deutschland• Christian Iwainsky, (SC) TU Darmstadt
An Intro to HPC Programming: Principles & Terminology |
| 15:30 – 16:00 | <ul style="list-style-type: none">• Coffee break |
| 16:00 – | <ul style="list-style-type: none">• <i>Introduction:</i> System Software - TU Environment
Dr. Andreas Wolf, (HRZ) TU Darmstadt |

9. April - Parallelization with MPI and Programming Tools



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|---------------|---|
| 9:00 – 10:30 | <ul style="list-style-type: none">• Dr. Markus Geimer, (JSC) Forschungszentrum Jülich
Challenges of the Exascale era - and how tools can help• <i>Tutorial: MPI Programming for Beginners</i>
Christian Iwainsky, (SC) TU Darmstadt |
| 10:30 – 11:00 | <ul style="list-style-type: none">• Coffee Break |
| 11:00 – 12:30 | <ul style="list-style-type: none">• <i>Tutorial: MPI Programming Advanced</i>
Dr. Sergey Boldyrev, (SC) TU Darmstadt• <i>Tutorial: Parallelization Strategies</i>
Dr. Andreas Wolf, (HRZ) TU Darmstadt |
| 12:30 – 14:00 | <ul style="list-style-type: none">• Lunch |
| 14:00 – 15:30 | <ul style="list-style-type: none">• <i>Lab: MPI</i>
Christian Iwainsky / Dr. Sergey Boldyrev (SC) / Dr. Andreas Wolf (HRZ),
TU Darmstadt |
| 15:30 – 16:00 | <ul style="list-style-type: none">• Coffee Break |
| 16:00 – 17:30 | <ul style="list-style-type: none">• <i>Tool: Totalview</i>
Dr. Sergey Boldyrev, (SC) TU Darmstadt• <i>Tool: Vampir</i>
Christian Iwainsky, (SC) TU Darmstadt |
| 19:00 – | <ul style="list-style-type: none">• Dinner |

10. April - Parallelization with OpenMP, Xeon Phi and Tuning



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|---------------|---|
| 9:00 – 10:30 | <ul style="list-style-type: none">• Prof. Dr. Gabriel Wittum, (G-CSC) Goethe University Frankfurt
Parallel Adaptive Simulation of Processes from Science and Engineering• Dr. Michael Klemm, INTEL
Introduction into the Intel XEON Phi co-processor |
| 10:30 – 11:00 | <ul style="list-style-type: none">• Coffee Break |
| 11:00 – 12:30 | <ul style="list-style-type: none">• Tutorial: OpenMP programming
Christian Terboven, (RZ) RWTH Aachen University |
| 12:30 – 14:00 | <ul style="list-style-type: none">• Lunch |
| 14:00 – 15:30 | <ul style="list-style-type: none">• Lab: OpenMP
Christian Terboven, (RZ) RWTH Aachen University /
Artur Mariano / Johannes Willkomm, (SC) TU Darmstadt |
| 15:30 – 16:00 | <ul style="list-style-type: none">• Coffee Break |
| 16:00 – 17:30 | <ul style="list-style-type: none">• Tool: Intel Cluster Studio
Michael Burger, (SC) TU Darmstadt• Tutorial: OpenMP and Performance
Christian Terboven, (RZ) RWTH Aachen University |

11. April - Accelerators, CUDA and OpenAcc Programming



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|---------------|--|
| 9:00 – 10:30 | <ul style="list-style-type: none">• Prof. Andreas Koch, (ESA) TU Darmstadt
Matching the Architecture to the Application: Reconfigurable Computing• <i>Tutorial: CUDA - GPU Programming I</i>
Prof. Michael Goesele, (GRIS) TU Darmstadt |
| 10:30 – 11:00 | <ul style="list-style-type: none">• <i>Coffee break</i> |
| 11:00 – 12:30 | <ul style="list-style-type: none">• <i>Tutorial: CUDA - GPU Programming II</i>
Prof. Michael Goesele, (GRIS) TU Darmstadt• <i>Tutorial: OpenACC - GPU Programming</i>
Sandra Wienke, (RZ) RWTH Aachen University |
| 12:30 – 14:00 | <ul style="list-style-type: none">• <i>Lunch</i> |
| 14:00 – 15:30 | <ul style="list-style-type: none">• <i>Lab: CUDA + OpenACC</i>
André Schulz, (GRIS) TU Darmstadt /
Sandra Wienke, (RZ) RWTH Aachen University |
| 15:30 – 16:00 | <ul style="list-style-type: none">• <i>Coffee break</i> |
| 16:00 – 17:30 | <ul style="list-style-type: none">• Sandra Wienke, (RZ) RWTH Aachen University
Case Study on productivity and performance of GPGPUs• <i>Closing remarks</i> |



Questions ???