



Centre of excellence

TRAINING AT HLRS IN 2016

1 Introduction

The following courses are given also in other years, for the schedule, check <http://www.hlrs.de/training/>. This list provides information about the course content, prerequisites and levels.

2 COURSES

22.02.2016 - 26.02.2016 Iterative Linear Solvers and Parallelization HLRS, Stuttgart (German)

The focus is on iterative and parallel solvers, the parallel programming models MPI and OpenMP, and the parallel middleware PETSc.

Keywords: Parallelization, Iterative solvers, Programming models

Prerequisites: Basic mathematics, Programming skills in C or Fortran, Linux

Level: Professional

Link: <http://www.hlrs.de/training/2016-02-22-iter-s/>

07.03.2016 - 11.03.2016 CFD with OpenFOAM® HLRS, Stuttgart (German)

OpenFOAM® is a widely-used open-source code and a powerful framework for solving a variety of problems mainly in the field of CFD. The five-day workshop gives an introduction to OpenFOAM® applied on CFD phenomena and is intended for beginners as well as for people with CFD background knowledge.

Keywords: Computational fluid dynamics

Prerequisites: Linux, Basic programming skills, Basic mathematics

Level: Newbie and Advanced

Link: <http://www.hlrs.de/training/2016-03-07-of1/>

14.03.2016 - 16.03.2016 GPU Programming using CUDA HLRS, Stuttgart (English)

The course provides an introduction to the programming language CUDA which is used to write fast numeric algorithms for NVIDIA graphics processors (GPUs).

Keywords: CUDA, Programming, Tools

Prerequisites: Programming skills in C, Parallel programming

Level: Newbie and Advanced

Link: <http://www.hlrs.de/training/2016-03-14-cuda1/>

17.03.2016 - 18.03.2016 OpenMP GPU Directives for Parallel Accelerated Supercomputers HLRS, Stuttgart (English)

This workshop will cover the programming environment of Cray hybrid supercomputer, which combines multicore CPUs with GPU accelerators. Attendees will learn about the directive-based OpenMP programming model whose multivendor support allows users to portably develop applications for parallel accelerated supercomputers.

Keywords: Programming models, Hybrid Programming, parallelization, Programming, Programming tools

Prerequisites: Programming skills in Fortran or C, Parallel programming

Level: Advanced and Professional

Link: <http://www.hlrs.de/training/2016-03-17-xk/>

04.04.2016 - 08.04.2016 Fortran for Scientific Computing HLRS, Stuttgart (English)

This course is dedicated to scientists and students to learn (sequential) programming with Fortran of scientific applications.

Keywords: Fortran, Optimization

Prerequisites: Linux, Linux editors, Basic programming skills, Basic mathematics

Level: Advanced

Link: <http://www.hlrs.de/training/2016-04-04-ftn1/>

12.04.2016 - 15.04.2016 Cray XC40, Parallel I/O, and Optimization Courses HLRS, Stuttgart (English)

The goal of this course is to inform about HazelHen, its efficient usage including all aspects of optimization (parallel code, I / O, etc.).

Keywords: Optimization, Performance tools, Profiling

Prerequisites: Code and datasets, HLRS system access, programming skills, Linux

Level: Professional

Link: <http://www.hlrs.de/training/2016-04-12-xc40-1/>

18.04.2016 - 19.04.2016 Scientific Visualization HLRS, Stuttgart (English)

This two day course is targeted at researchers with basic knowledge in numerical simulation, who would like to learn how to visualize their simulation results on the desktop but also in Augmented Reality and Virtual Environments.

Keywords: Visualization, Augmented reality

Prerequisites: Basic mathematics, Basic simulation, Basic programming skills

Level: Newbie

Link: <http://www.hlrs.de/training/2016-04-18-vis1/>

***Particular GSS relevance:** This visualization course offers a comprehensive overview of available visualization methods. A special focus is put on the visualization of 3D information. In the context of GSS, the course allows to visualize complex network and graph structures, to interactively analyze simulation data and to use augmented reality. Big parts of the course are structured interactively and allow the participant to visualize her/his own data on the visualization infrastructure of the HLRS.*

20.04.2016 - 21.04.2016 NEC SX-ACE - Vectorization and Optimization HLRS, Stuttgart (English)

In spring 2015, HLRS installed a next generation vector computer, a NEC SX-ACE. The participants learn about the configuration of the NEC SX-ACE system at HLRS and how to use this cluster of vectorizing shared memory nodes. One focus is an introduction in vectorization. More experienced users can learn how to optimize programs based on performance measurements. Additional topics are I/O and the optimization of application programs.

Keywords: Optimization, Vectorization, Parallelization

Prerequisites: Programming skills in C or Fortran, Parallel programming

Level: Newbie and Advanced

Link: <http://www.hlrs.de/training/2016-04-20-nec/>

02.06.2016 - 03.06.2016 Introduction to Unified Parallel C (UPC) and Co-array Fortran (CAF) HLRS, Stuttgart (English)

Partitioned Global Address Space (PGAS) is a new model for parallel programming. Unified Parallel C (UPC) and Co-array Fortran (CAF) are PGAS extensions to C and Fortran.

Keywords: Programming models, Parallelization, Programming,
Prerequisites: Parallel programming, Programming skills in Fortran or C
Level: Advanced and Professional
Link: <http://www.hlrs.de/training/2016-06-02-upc1/>

06.06.2016 - 07.06.2016 Efficient Parallel Programming with GASPI HLRS, Stuttgart (English)

In this tutorial we present an asynchronous data flow programming model for Partitioned Global Address Spaces (PGAS) as an alternative to the programming model of MPI.

Keywords: Parallelization, Programming models
Prerequisites: Linux, Basic programming skills in C or Fortran
Level: Advanced
Link: <http://www.hlrs.de/training/2016-06-06-gaspi/>

13.06.2016 Introduction to Hybrid Programming in HPC HLRS, Stuttgart (English)

Most HPC systems are clusters of shared memory nodes. Such SMP nodes can be small multi-core CPUs up to large many-core CPUs. Parallel programming may combine the distributed memory parallelisation on the node interconnect (e.g., with MPI) with the shared memory parallelisation inside of each node (e.g., with OpenMP or MPI-3.0 shared memory). This course analyses the strengths and weaknesses of several parallel programming models on clusters of SMP nodes.

Keywords: Programming models, Parallelization, Hybrid programming
Prerequisites: Basic programming skills, Basic MPI and OpenMP knowledge, Linux
Level: Advanced and Professional
Link: <http://www.hlrs.de/training/2016-06-13-hy-s/>

15.06.2016 - 15.06.2016 Cluster Workshop HLRS, Stuttgart (German)

Within this course, information on cluster hardware, management and operation are provided to the interested audience. The main goal is to teach the audience how to operate their own clusters.

Keywords: Compute cluster, System architecture, Administration, Maintenance

Prerequisites: Linux, Administration

Level: Newbie and Advanced

Link: <http://www.hlrs.de/training/2016-06-15-cluster/>

27.06.2016 - 28.06.2016 Node-Level Performance Engineering HLRS, Stuttgart (English)

This course teaches performance engineering approaches on the compute node level.

Keywords: Optimization, Performance tools, Compute architecture, Profiling

Prerequisites: Basic programming skills in Fortran or C

Level: Advanced and Professional

Link: <http://www.hlrs.de/training/2016-06-27-nlp/>

Particular GSS relevance: *This workshop is designed for participants that already use running simulation tools on HPC and aim to improve their parallel performance. Especially for agent-based models, the issue of balancing the load and communication between nodes is critical and usually cannot be solved by general approaches. Thus, effective solutions often must be tailored for the particular simulation tool, its structure and in some case even specific to the simulation problem at hand. The course offers an overview over available tools and common approaches that help the participant to identify the most promising approaches.*

30.06.2016 Introduction in Cluster File Systems HLRS, Stuttgart (German)

This course teaches about the cluster file systems and evaluates the most common ones. In particular, differences, architectures and functionalities are highlighted and compared.

Keywords: Compute cluster, File systems
Prerequisites: Linux, File systems, Administration
Level: Advanced and Professional
Link: <http://www.hlrs.de/training/2016-06-30-cluster-fs/>

12.09.2016 - 16.09.2016 Introduction to Computational Fluid Dynamics in High Performance Computing HLRS, Stuttgart (German)

The course deals with current numerical methods for Computational Fluid Dynamics in the context of high performance computing.

Keywords: Computational fluid dynamics
Prerequisites: Basic mathematics, Programming skills in C or Fortran
Level: Newbie
Link: <http://www.hlrs.de/training/2016-09-12-cfd-s/>

19.09.2016 - 23.09.2016 CFD with OpenFOAM® HLRS, Stuttgart (German)

OpenFOAM® is a widely-used open-source code and a powerful framework for solving a variety of problems mainly in the field of CFD. The five-day workshop gives an introduction to OpenFOAM® applied on CFD phenomena and is intended for beginners and people with CFD background knowledge.

Keywords: Computational fluid dynamics
Prerequisites: Linux, Basic programming skills, Basic mathematics
Level: Newbie and Advanced
Link: <http://www.hlrs.de/training/2016-09-26-of2/>

17.10.2016 - 21.10.2016 Parallel Programming Workshop HLRS, Stuttgart (English)

Distributed memory parallelization with the Message Passing Interface MPI (Mon+Tue, for beginners)

Keywords: Programming models, Programming, Parallelization

Prerequisites: Linux, knowledge in C or Fortran

Level: Advanced

Link: <http://www.hlrs.de/training/2016-10-17-par/>

***Particular GSS relevance:** This workshop provides a general background of programming in OpenMP and MPI in the languages C and Fortran. It is especially useful for GSS-scientists who aim to implement their GSS simulation tool as parallel frameworks or start working with HPC frameworks. All basic functionalities of MPI and OpenMP are introduced, together with the individual conceptual differences and application possibilities. Through different application examples, the participants become familiar with using both messaging interfaces appropriately and develop an understanding, which implementation will work best for their framework.*

The workshop is also useful for participants that develop tools using agent-based models that already have the ability to run on HPC clusters, like Pandora, Repast or Flame. Understanding MPI and its inner logic will help to use, understand and extend the structure of such frameworks more easily.

25.10.2016 - 28.10.2016 Cray XC40, Parallel I/O, and Optimization Courses HLRS, Stuttgart (English)

The new Cray system Hazelhen will be introduced in detail with special focus on hardware, optimization and efficient system usage in general. Within the workshop, there are particular hand-on sessions for the participants.

Keywords: Hardware architecture, Optimization, Parallelization

Prerequisites: Linux, basic programming skills

Level: Newbie

Link: <http://www.hlrs.de/training/2016-10-25-xc40-2/>

03.11.2016 - 04.11.2016 Scientific Visualization HLRS, Stuttgart (English)

This two day course is targeted at researchers with basic knowledge in numerical simulation, who would like to learn how to visualize their simulation results on the desktop but also in Augmented Reality and Virtual Environments.

Keywords: Visualization, Augmented reality
Prerequisites: Basic mathematics, Basic simulation, Basic programming skills
Level: Newbie
Link: <http://www.hlrs.de/training/2016-11-03-vis2/>

12.12.2016 - 16.12.2016 Fortran for Scientific Computing HLRS, Stuttgart (German)

This course is dedicated for scientists and students to learn (sequential) programming with Fortran of scientific applications.

Keywords: Fortran, Optimization
Prerequisites: Linux, Linux editors, Basic programming skills, Basic mathematics
Level: Advanced
Link: <http://www.hlrs.de/training/2016-12-12-ftn2/>