












5-Day-Course — 1st day (Monday)

Message Passing Interface (MPI-1, part 1)

- 9:00 **Introduction** [1] (talk) 
- 9:10 **Parallel Architectures and Programming Models** [2] (talk) 
- 10:10 **Coffee**
- 10:25 **MPI-1 – Introduction to the Message Passing Interface** [3+3a] (talk) 
- 10:25 **Chap. 1 MPI Overview** (talk) 
- 10:45 **Chap. 2 MPI Process model** (talk+practical) 
- 12:00 **Lunch**
- 13:00 **Chap. 3 Messages and Point-to-Point Communication** (talk+practical) 
- 14:15 **Coffee**
- 14:30 **Chap. 4 Non-Blocking Communication** (talk+practical) 
- 15:45 **Coffee**
- 16:00 **Chap. 5 Derived Datatypes** (talk+practical) 
- Writing Message-Passing Parallel Programs with MPI** [4] (only in the handouts)
- 17:00 **Parallel debugging** [5] (talk+practical)   
- 17:30 **End**













Introduction
Slide 9 (5 days) Rolf Rabenseifner
Höchstleistungsrechenzentrum Stuttgart

H L R I S 

5-Day-Course — 2nd day (Tuesday)

Message Passing Interface (MPI-1, part 2) and OpenMP

- 9:00 **Chap. 6 Virtual Topologies** [3, continued] (talk+practical) 
- 10:10 **Coffee**
- 10:25 **Chap. 7 Collective Communication** (talk+practical) 
- 11:00 **Coffee**
- 11:15 **Chap. 8 Other MPI-1 features** (talk) 
- 11:40 **Heat conduction program, a parallelization example with MPI** [6] (talk)  
- 12:00 **Lunch**
- 13:00 **OpenMP – Overview, execution model, work sharing** [7+7a] (talk+practical) 
- 14:30 **Coffee**
- 14:45 **OpenMP – Data environment and combined constructs** (talk+practical - HEAT) 
- 16:00 **Coffee**
- 16:15 **OpenMP – Summary and Pitfalls** (talk) 
- 16:45 **Assure – detection of OpenMP race conditions** [8] (talk+practical)  
- 17:30 **End**















Introduction
Slide 10 (5 days) Rolf Rabenseifner
Höchstleistungsrechenzentrum Stuttgart

H L R I S 

5-Day-Course — 3rd day (Wednesday)

MPI-2 and advanced MPI programming (5-day course)

- 9:00 **Access to the federal high-performance computing-centers** [9] (talk)  
- 9:30 **MPI-2 overview** [10] (talk) 
- 9:45 **MPI-2 parallel file I/O (basics)** [11+11a] (talk+practical) 
- 10:45 **Coffee**
- 11:00 **MPI-2 parallel file I/O (fileviews)** (talk+practical) 
- 12:00 **Lunch**
- 13:00 **MPI-2 parallel file I/O (access methods)** (talk+practical) 
- 14:00 **Coffee**
- 14:15 **MPI-2 one-sided Communication** [12+12a] (talk+practical) 
- 15:15 **Coffee**
- 15:30 **Other MPI-2 chapters** [13] (talk)  **from 27**
- 16:00 **Optimization of MPI applications** [14] (talk) 
- 16:30 **Coffee**
- 16:45 **VAMPIR and other tools for performance analysis** [16, 17] (talk+practical)  
- 17:10 **Application Support at HLRS** [18] (talk) 
- 17:30 **End**













Introduction
Slide 11 (5 days) Rolf Rabenseifner
Höchstleistungsrechenzentrum Stuttgart

H L R I S 

5-Day-Course — 4th day (Thursday)

Advanced OpenMP programming and PETSc

- 9:00 **OpenMP – Cluster extensions** [20] (talk) 
- 10:00 **Coffee**
- 10:15 **OpenMP – Tools** [21] (talk) 
- 10:45 **OpenMP – Performance tuning and OpenMP** [22] (talk+practical) 
- 12:00 **Lunch**
- 13:00 **Parallel programming models on hybrid systems / MPI + OpenMP** [23] (talk)  
- 14:00 **Coffee**
- 14:15 **PETSc Tutorial** [41] (talk) 
- 15:00 **Laplace-Example with MPI and PETSc** [42] (talk+practical)  
- 16:00 **Coffee**
- 16:15 **Grid Computing: Easy Access to Distributed Resources** [19a] (talk) 
- 16:45 **Virtual reality based visualization** [30] (talk and online demo in the "cave") 
- 17:30 **End**













Introduction
Slide 13 (5 days) Rolf Rabenseifner
Höchstleistungsrechenzentrum Stuttgart

H L R I S 

5-Day-Course — 5th day (Friday)

Domain Decomposition and Load Balancing

- 9:00 **Domain decomposition of structured and unstructured grids** [31] (talk) 
- 10:00 **Coffee**
- 10:15 **Load balancing** [32+32a] (talk+practical) German:   English:  
- 11:30 **Numerical and parallel libraries** [33] (talk) 
- 11:50 **Parallel numerics (part1)** [34] (talk) 
- 12:30 **Lunch**
- 13:30 **Parallel numerics (part2)** (talk) 
- 14:15 **Coffee**
- 14:25 **Particle based domain decomposition** [35] (talk) 
- 15:10 **Coffee**
- 15:20 **Object oriented parallel programming with C++** [36] (talk) 
- 16:30 **End**



Introduction Rolf Rabenseifner
Slide 14 (5 days) Höchstleistungsrechenzentrum Stuttgart

H L R I S 

1st
day