

# Iterative Linear Solvers & Parallelization @HLRS – 1<sup>st</sup> day

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## Content

### MPI on beginners' level [Rolf Rabenseifner]



1. MPI Overview
2. Process model and language bindings
3. Messages and point-to-point communication
4. Nonblocking communication

File: [mpi 3.1 rab.pdf](#)

## Schedule







- 08:30 Local registration  
09:00 Welcome  
09:05 Lectures and exercises on MPI  
(including some breaks)  
12:30 Lunch break  
13:45 Lectures and exercises on MPI  
(including some breaks)  
16:45 End

# Iterative Linear Solvers & Parallelization @HLRS – 2<sup>nd</sup> day

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## Content

### Shared memory parallelization with OpenMP [Rolf Rabenseifner]

- Overview 
- Execution model 
- Worksharing directives 
- Worksharing – continued (Exe 2b) 
- Data environment 
- Summary
- Pitfalls 
- Q&A

File: [openmp-intro13.pdf](#)

## Schedule






- 08:45 Login to ZOOM  
(and establishing the break-out rooms)  
09:00 Lectures and exercises on OpenMP  
(including some breaks)  
12:30 Lunch break  
13:45 Lectures and exercises on OpenMP  
(including some breaks)  
16:45 Final end

# Iterative Linear Solvers & Parallelization @HLRS – 3<sup>rd</sup> day

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## Content

### Iterative Solvers for Large Linear Systems [Andreas Meister]

- 9:00 Introduction, Basics and Practicals (Lecture + Practicals)
- 10:00 Consistency and Convergence (Lecture)
- 11:00 Break
- 11:30 Jacobi Method (Lecture)
- 12:15 Practicals
- 13:00 Lunch
- 14:15 Gauß-Seidel Method (Lecture)
- 14:45 Practicals
- 15:15 Q+A
- 15:30 Break
- 15:45 **MPI:**
  - 6-(1) Collective Communication     
  - File: [mpi 3.1 rab.pdf](#)
- 16:45 End

## Schedule


- 08:45 Local registration
- 09:00 Lectures & exercises on Iterative Solvers (including some breaks)
- 13:00 Lunch break [30 Minutes later!]
- 14:15 Lectures & exercises on Iterative Solvers (including some breaks)
- 15:30 Other options on MPI
- 16:45 Final end

# Iterative Linear Solvers & Parallelization @HLRS – 4<sup>th</sup> day

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## Content

### Iterative Solvers for Large Linear Systems [Andreas Meister]

- 9:00 Relaxation Schemes (Lecture)
- 10:00 Practicals
- 10:45 Break
- 11:00 Method of Steepest Descent (Lecture)
- 11:30 Practicals
- 12:00 Lunch
- 13:15 Method of Conjugate Gradients (Lecture)
- 14:15 Practicals
- 15:00 Q+A
- 15:15 Break
- 15:30 **MPI & OpenMP:**
  - Parallelization of Explicit and Implicit Solvers (talk) 
  - File: [parallelization\\_rab.pdf](#)
- 16:45 End

## Schedule

- 08:45 Local registration
- 09:00 Lectures & exercises on Iterative Solvers (including some breaks)
- 12:00 Lunch break [30 Minutes earlier!]
- 13:15 Lectures & exercises on Iterative Solvers (including some breaks)
- 15:30 For MPI & OpenMP: Parallelization
- 16:45 Final end






# Iterative Linear Solvers & Parallelization @HLRS – 5<sup>th</sup> day

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## Content

### Iterative Solvers for Large Linear Systems

[Andreas Meister]

- 09:00 Introduction to Multigrid Methods (Lecture)
- 10:00 Practicals
- 10:30 Break
- 10:45 GMRES and BICG (Lecture)
- 11:45 Practicals
- 12:15 Lunch
- 13:30 Variants of BICG (Lecture)
- 14:00 Practicals
- 14:30 Preconditioning
- 15:30 Q+A
- 15:45 Break
- 16:00 **MPI: 12. Derived datatypes** (talk w/o practical)  
(1) transfer any combination of typed data  
File: [mpi 3.1 rab.pdf](#)     
- 16:30 Q+A / Feedback
- 16:45 End

## Schedule

- 08:45 Local registration
- 09:00 Lectures & exercises on Iterative Solvers  
(including some breaks)
- 12:15 Lunch break [15 Minutes earlier!]
- 13:30 Lectures & exercises on Iterative Solvers  
(including some breaks)
- 16:00 Other options on MPI
- 16:30 Feedback
- 16:45 Final end