Iterative Linear Solver & Parallelization @HLRS – 1st day

Content

MPI on beginners' level

1. MPI Overview
2. Process model and language bindings

3. Messages and point-to-point communication
4. Nonblocking communication 

Social event (free guided city-tour + dinner (self-paying))

Schedule

08:30 Local registration
09:00 Welcome
09:15 Lectures and exercises on MPI
(including some breaks)
13:00 Lunch break
14:00 Lectures and exercises on MPI
(including some breaks)
18:00 End of course content
18:15 Free guided city-tour
20:00 Dinner in Stuttgart downtown
(self-paying)

Other options:

Parallel Architectures and Programming Models 

Other MPI chapters, e.g.,

7. Error handling
12. Derived datatypes
    (1) transfer any combination of typed data
15. Probe, Persistent Requests, Cancel

Iterative Linear Solver & Parallelization @HLRS – 2nd day

Content

MPI on beginners' level – continued 

6.(1) Collective communication

Shared memory parallelization with OpenMP 

Overview 
Execution model 
Worksharing directives 

Worksharing – continued (Tasks …) 
Data environment 
Heat example (homework) 
Summary 
Pitfalls 

Shared memory parallelization with OpenMP

Verifying an OpenMP Parallelization with the Intel Inspector XE 

Schedule

08:45 Local registration
09:00 Lectures and exercises on MPI
(including some breaks)
10:45 Lectures and exercises on OpenMP
(including some breaks)
13:00 Lunch break
14:00 Lectures and exercises on OpenMP
(including some breaks)
17:30 Verifying an OpenMP Parallelization with the Intel Inspector XE
18:00 Optional:
Exercises with the Intel Inspector XE
18:00/18:30
Final end without/with the exercise

Other options:

Other MPI chapters, e.g.,

7. Error handling
8. Groups & Communicators, Environment Management
   (1) MPI_Comm_split, intra- & inter-communicators
9. Virtual topologies
   (1) A multi-dimensional process naming scheme

Iterative Linear Solver & Parallelization @HLRS – 3rd day

Content

Iterative Solvers for Large Linear Systems [Andreas Meister]

9:00 Introduction and Basics (I) (talk)
10:30 Coffee
10:45 Classical Splitting Schemes (II) (talk)
12:00 Practical (Jacobi-scheme, Exercise 1+2) (practical)
12:20 Lunch
13:20 Practical (Jacobi-scheme, Exercise 1+2) (continued)
14:15 Conjugate Gradient Method (CG) (III) (talk)
15:30 Coffee
15:45 Practical (CG, Exercise 3+4) (practical)
17:15 Other options on MPI
18:00 End

Other options: 

Other MPI chapters, e.g.,
5. The New Fortran Module mpi_f08
10-17. Short tour through other chapters

Schedule

08:45 Local registration
09:00 Lectures & exercises on Iterative Solvers (including some breaks)
12:20 Lunch break
13:20 Lectures & exercises on Iterative Solvers (including some breaks)
17:00 Other options on MPI
18:00 Final end

Iterative Linear Solver & Parallelization @HLRS – 4th day

Content

Iterative Solvers for Large Linear Systems [Andreas Meister]

9:00 Multigrid Methods (IV) (talk)
10:30 Coffee
10:45 GMRES, BiCG and Variants (V) (talk)
12:20 Lunch
13:20 GMRES, BiCG and Variants (V) (talk, part II)
14:00 Practical (Multigrid and Krylov subspace methods, Exercises 5+6) (prac.)
14:45 Coffee
15:00 Preconditioning (V) (talk)
15:45 Q & A [Andreas Meister]
16:00 Coffee + Q&A [Andreas Meister]
16:15 **MPI** Chap. 10-14 More details [3, Rolf Rabenseifner] (talk) 

2nd skip-points [31 slides] Ch.10 [5], 11[12], 12[3], 13[5], 14[6]
17:20 Coffee
17:30 **OpenMP**-4.0 and 4.5 Extensions [7A] (talk) 

18:15 End

Schedule

08:45 Local registration
09:00 Lectures & exercises on Iterative Solvers (including some breaks)
12:20 Lunch break
13:20 Lectures & exercises on Iterative Solvers (including some breaks)
16:15 For MPI & OpenMP:
More details
OpenMP-4.0 / 4.5 / 5.0 Extensions
18:15 Final end

Iterative Linear Solver & Parallelization @HLRS – 5th day

Content

Parallelization Examples 1-4 5-9 10-14 15-18

[Rolf Rabenseifner]

9:00 Parallelization of Explicit and Implicit Solvers (talk)

10:30 Coffee

10:45 Laplace-Example with MPI and PETSc

- Introduction [42a] (talk)
- Writing a parallel MPI program with a CG solver [42b] (talk+practical) MPI

12:15 Lunch

13:15 Feedback

13:30 PETSc Tutorial [41] (talk) 221

14:15 Coffee

14:30 Laplace-Example with PETSc [42c] (talk) PET

15:15 Summary and Q&A (talk+discussion)

15:30 End

Schedule

08:45 Local registration

09:00 Lectures & exercises on interm. MPI (including some breaks)

12:15 Lunch break

13:15 Lectures & exercises on interm. MPI (including some breaks)

15:30 Final end