5-Day-Course — ZIH, TU Dresden — 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

Schedule

08:30 Local registration

09:00 Welcome

09:15 Lectures and exercises on MPI
(including some breaks)

12:30 Lunch break

13:30 Lectures and exercises on MPI
(including some breaks)

18:00 Final end

19:00 **Short tour through the old town**
Meeting Point:
King Johann Memorial in front of the Semper Opera (free)

20:15 **Restaurant**
(self-paying)

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5-Day-Course — ZIH, TU Dresden — 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

Schedule

08:30 Lectures and exercises on MPI
(including some breaks)

10:15 Lectures and exercises on OpenMP
(including some breaks)

12:30 Lunch break

13:30 Lectures and exercises on OpenMP
(including some breaks)

17:30 Final end

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5-Day-Course — ZIH, TU Dresden — 3rd day

Content

MPI on intermediate level

7. Error handling
8. Groups & Communicators, Environment Management
   (1) MPI_Comm_split, intra- & inter-communicators
   (2) Advanced topics (short summary)
9. Virtual topologies
   (1) A multi-dimensional process naming scheme
   (2) Neighborhood-communication + MPI_BOTTOM (no practical)
   (3) Optimized re-numbering (short summary)

12. Derived datatypes (until 1st exercise)
    Derived datatypes (continued)
    (1) transfer any combination of typed data

19. Heat example

MPI on beginners' level – continued (Fortran users only)

5. The New Fortran Module mpi_f08

Schedule

08:30 Lectures & exercises on interm. MPI (including some breaks)
12:30 Lunch break
13:30 Lectures & exercises on interm. MPI (including some breaks)
16:30 For C and Python participants only: Heat practical continued
For Fortran participants only: Additional lecture + exercises on the mpi_f08 module/interface
17:30 Final end

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5-Day-Course — ZIH, TU Dresden — 4th day

Content

Debugging [D…] and Performance Tools [P…] for Parallel Programming

Introduction to Parallel Debugging [D1]
Verifying an OpenMP Parallelization [D2]
MPI Correctness Checking with MUST [D3]
Parallel Debugging with DDT [D4]
Introduction to Performance Engineering [P1]
Score-P: A Joint Performance Measurement Run-Time Infrastructure [P2]
Profile examination with CUBE [P3 + P3.5]
Data Analysis with Vampir [P4]
Score-P and Vampir Analysis Examples [P5]

Schedule

08:30 Lectures & exe. on Debugging Tools (including one break)
12:00 Lunch break
13:00 Lectures & exe. on Performance Tools (including one break)
17:30 Final end

Optional: 2nd social event (Restaurant)

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5-Day-Course — ZIH, TU Dresden — 5th day

Content

Advanced MPI

10. One-sided Communication
11. Shared Memory One-sided Communication
    (1) MPI_Comm_split_type & MPI_Win_allocate_shared
    (2) MPI memory models and synchronization rules (no pract.)

Short tour through

- 6.(2) Advanced topics on collective communication
- 12.(2) Advanced topics on derived datatypes (title slide)
- 13. Parallel File I/O (title + 5 slides)
- 14. MPI and Threads (title +1 slide)
- 15. Probe, Persistent Requests, Cancel (title + 3 slides)
- 16. Process Creation and Management (title + 3 slides)
- 17. Other MPI features (regular 4 slides)

18. Best practice

MPI Summary

Shared memory parallelization with OpenMP

OpenMP-4.0 / 4.5 / 5.0 Extensions

Schedule

08:30 Lectures & exercises on advanced MPI
(including some breaks)

12:30 Lunch break

13:30 Lectures & exercises on advanced MPI
(including some breaks)

15:30 For OpenMP users:
OpenMP-4.0 / 4.5 / 5.0 Extensions

16:30 Final end

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