

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**
Augustiner an der Frauenkirche
An der Frauenkirche 16-17, 01067 Dresden
<https://augustiner-dresden.com/>
(self-paying)

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

Further OpenMP lectures: OpenMP-4.0 / 4.5 / 5.0 Extensions (Friday)

Verifying an OpenMP Parallelization with the Intel Inspector (Thursday)

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 Fortran participants only:** Additional lecture + exercises on the mpi_f08 module/interface
- 17:30 Final end

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 with the Intel Inspector [D2] (may be already on Tuesday)
- 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)
- 16:30 Final end
- 18:00 Treffpunkt: Mitte vor der Semperoper (Öffnung: Haus 18:00, Saal 18:30)
- 18:15 Werkeinführung im Opernkeller (~15 Min.)
- 19:00-22:00 Semperoper (1 Pause)
Le nozze di Figaro, Opera buffa, Wolfgang Amadeus Mozart
- ~22:30 Nightcap at Max Altstadt (~6 Min. from Semper opera)

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 – optional

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 – optional:**
OpenMP-4.0 / 4.5 / 5.0 Extensions

16:30 Final end