

# Preliminary Agenda 2024/JSC

## Day 1: 8:45 - 16:45

08:45 Login to ZOOM (and establishing the break-out rooms)  
09:00 Welcome  
09:15 Lectures and exercises on intermediate/advanced MPI (including some breaks)  
13:00 Lunch break  
14:30 Lectures and exercises on intermediate/advanced MPI (including some breaks)  
16:45 End

## Day 2: 8:45 - 16:45

08:45 Login to ZOOM (and establishing the break-out rooms)  
09:00 Lectures and exercises on intermediate/advanced MPI (including some breaks)  
13:00 Lunch break  
14:30 Lectures and exercises on intermediate/advanced MPI (including some breaks)  
16:45 End

## Day 3: 8:45 - 16:45

08:45 Login to ZOOM (and establishing the break-out rooms)  
09:00 Lectures and exercises on intermediate/advanced MPI (including some breaks)  
13:00 Lunch break  
14:30 Lectures and exercises on intermediate/advanced MPI (including some breaks)  
16:45 End

## Day 4: 8:45 - 16:45

08:45 Login to ZOOM (and establishing the break-out rooms)  
09:00 Lectures and exercises on advanced MPI (including some breaks)  
13:00 Lunch break (30 Min. earlier than on previous days)  
14:30 Lectures and exercises on advanced OpenMP 4.0, 4.5 and 5.0 + Q&A  
16:15 Lectures and exercises on race-condition detection  
16:45 Final end

## **Content** (preliminary, the numbers refer to MPI course chapters)

### **Prerequisites: MPI on beginners' level**

**Prior to the course**, you may use the course material to recapitulate your knowledge.

**MPI:** Distribute memory parallelization with MPI

1. MPI Overview
2. Process model and language bindings
3. Messages and point-to-point communication
6. (1) Blocking collective communication

**OpenMP:** Shared Memory Parallelization with OpenMP Version 3.1

### **Days 1-2: MPI on intermediate level**

Message Passing Interface (MPI)

4. Nonblocking communication
6. (1) Collective communications (short tour / recap)  
(2) Advanced topics on collective communications
8. Groups & Communicators, Environment Management  
(1) MPI\_Comm\_split, intra- & inter-communicators  
(2) Advanced topics on communicators (short tour)
9. Virtual topologies  
(1) A multi-dimensional process naming scheme  
(2) Neighborhood communication + MPI\_BOTTOM

### **Days 2-3: MPI on intermediate/advanced level**

10. One-sided Communication
11. Shared Memory One-sided Communication  
(1) MPI\_Comm\_split\_type & MPI\_Win\_allocate\_shared
12. Derived datatypes  
(1) transfer any combination of typed data
15. Probe, Persistent Requests, Cancel (short tour)
12. (2) Advanced topics on derived datatypes

Only for Fortran programmers:

5. The New Fortran Module mpi\_f08

### **Days 3-4: MPI on advanced level**

11. (2) Shared Mem. One-sided Communication: MPI memory models & synchronization rules
7. Error handling

Short tour through

13. Parallel File I/O
14. MPI and Threads
16. Process Creation and Management
17. Other MPI features

9. (3) Virtual topologies: Optimization through reordering (talk only)
18. Best practice

Summary

### **Day 4: OpenMP on intermediate/advanced level**

- OpenMP-4.0, 4.5 and 5.0 Extensions
- Verifying an OpenMP Parallelization with the Intel Inspector