

Introduction to High Performance Computing and Optimization

PVL part III - MPI parallelization

To get points for the parts of the PVL, the C++ code, the job scripts and, depending on the task, the times achieved must be submitted. The submission takes place via the upload in OPAL in the corresponding course element. Copying or typing code from fellow students is not permitted. You must write and submit your own code. The specified submission deadline must be adhered to. Your code will be tested. Faulty code and code that delivers significantly different times than specified will result in zero points for the PVL part. So make sure that the code has been compiled on the cluster and executed on the compute nodes.

Exercise 13

Recall the computation of an approximation of π by numerical integration using trapezoid rule:

$$\int_0^1 \frac{1}{1+x^2} = \arctan(1) - \arctan(0) = \pi/4.$$

- (a) Compute π using numerical integration using the trapezoid rule.
- (b) Parallelize the computation with MPI (Hint: `MPI_Reduce()`).
- (c) How much (real) time do you need to compute 7 digits of π ?
- (d) Perform a strong scaling test for the computation of at least 7 digits of π for 1, 2, 4, 8, 16 MPI ranks.

Submission deadline is 23:59 08.01.2025.