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**Title:** HPC, parallel programming and optimization

**Abstract.**

1) *Introduction to HPC architectures and environment*

The basic concepts behind HPC architectures, the programming paradigms and the application development will be presented and discussed, together with the evolution scenario as can be inferred from the general trends we observe today.

2) *The basic of parallel programming*

This lecture will focus on basic parallel programming techniques like the domain decomposition, functional decomposition and load balancing. The MPI library and OpenMP directives will be presented, and discussed as different approach to the parallelization, and then it will be explained how to combine them in order to exploit the massively parallel multi core architectures.

3) *Optimization techniques*

One of the most important task in the implementation of an high performance application is the code optimization. Infact, most applications written by experienced programmers usually do not perform better than few percent of the peak performance of modern CPU. In this lecture the optimization and tuning techniques are presented and explained in order to allow the programmers to enhance the applications performances.