

# HPC Cluster usages and perspectives

Konstantinos Iliakis

Doctoral Student  
BE-RF-FB

*konstantinos.iliakis@cern.ch*



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# MPI-over-OpenMP BLonD implementation

## Project Overview

- BLonD: Python code with C++ extensions (ctypes).
- mpi4py to co-ordinate Python processes, calling C++ libraries, parallelized with OpenMP.
- Master-worker model:
  - Master: initializes, spawns workers, handles control flow and distributes tasks.
  - Worker: Receives & executes tasks until a stop signal arrives.
  - Minimal communication between workers.
- Early development stage (~ 1 week).

# Cluster Usage

## Development: Minor resource requirements

- ETA for a first working, un-optimized version:  $\sim$  1 month.
- Most of the debugging in an OpenLab server.

## Optimization & Evaluation: 1 User for benchmarking purposes

- Min. communication & serial parts, relax synchronization etc.
- Requirement: Out-perform the 56-core openmp version.
- ETA: 2 Months.

## Steady state: Few regular users (3-4)

- Target test-cases: i) Controlled emittance blow-up, LHC ramp  
ii) Multi-bunch stability studies, SPS ramp
- Estimated resource requirements:  $\sim$  3-4 nodes (32 or 40 cores) per simulation.