

Performance optimization of EUROfusion HPC code ERO2.0

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This talk presents how a performance analysis methodology [2] can guide the optimization of the EUROfusion HPC code ERO2.0 [1]. During the talk, we will understand: the analysis done to the code, how the analysis aided the design of the optimizations, and finally, the impact of the optimizations once implemented.

Using our methodology and the BSC performance tools (Extrac [4] and Paraver [3]), we identified a load balance problem (observed in Figure 1) in the simulation execution, which was caused by synchronization points of particles due to variability in computation time among particles. The synchronization points we found problematic were OpenMP parallel finalization and, at the end of the execution, MPI collectives. To solve these problems, we suggested some optimizations: changing the scheduling algorithm, dynamically cancelling particles that become bottlenecks, and changing the OpenMP parallelism technique.

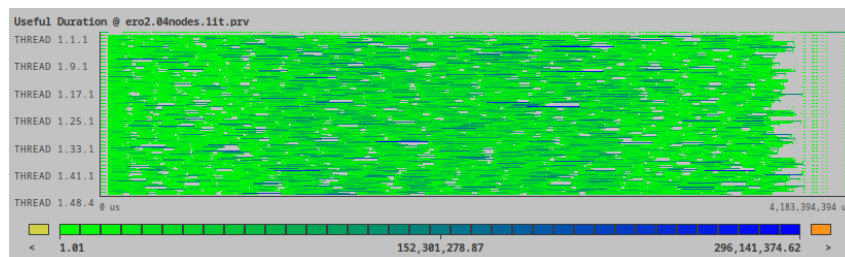


Figure 1: *Timeline of Useful Duration (grey gaps mean not useful computation, like MPI calls or OpenMP barriers).*

References

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