

## Aims of POP

The *Performance Optimisation and Productivity Centre of Excellence in Computing Applications* (POP) provides performance assessments of academic and industrial parallel codes.

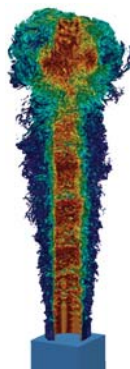
POP enables code owners to improve the efficiency of their codes and thus make better use of computing resources and analyse larger or more detailed problems.

## POP Services

POP services are free of charge to organisations in the EU.

- **Parallel Application Performance Audit:** Identify performance issues of customer code. 1 month duration.
- **Parallel Application Performance Plan:** Follow-up to the audit service. Identifies the root causes of the issues found and qualifies and quantifies approaches to address them. 1-3 months duration.
- **Proof-of-Concept:** Experiments and mock-up tests for customer codes, including kernel extraction, parallelisation or mini-apps experiments to show effect of proposed optimisations. 6 months duration.
- **Training:** Performance analysis of parallel applications, including processes and tools.

## Case Study: Ateles



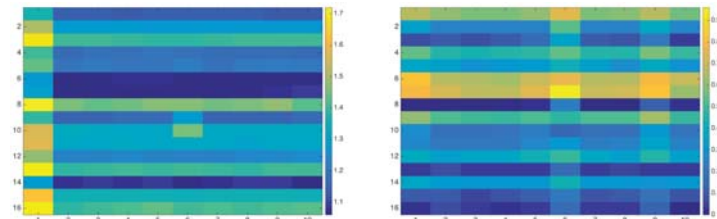
The Institute for Simulation Techniques and Scientific Computing of the University of Siegen develops a Fortran fluid dynamics code called Ateles. In a proof-of-concept study POP identified potential optimisations:

- Inlining of very short functions with high call rates
- Parameter and variable redefinitions that allow the reduction of expensive CPU operations like division

With these optimisations applied to the real code, we measured a performance increase of nearly 50% on the provided test case and the user confirmed a substantial performance improvement for production runs.

## Case Study: DROPS

DROPS is a tool for simulating two-phase flows. POP identified a computational load imbalance in the matrix setup stage that increased waiting times in MPI collective operations.

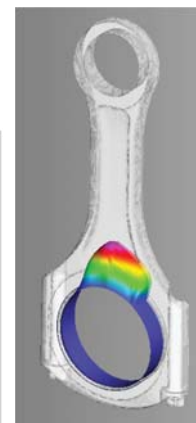
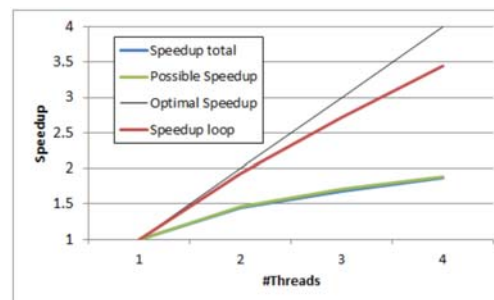


This is visualised in the above heat maps: the left shows the computation time in seconds per MPI rank, the right the idle time.

POP identified the cause of this load imbalance and, as it severely affected the performance of the code, recommended that it should be a priority to rectify it.

## Case Study: FIRST

FIRST is a simulation tool for elasto-hydrodynamic coupled multi-body systems written by IST mbH. POP identified that 63% of the code's run-time was spent in a single serial loop.



Parallelising the loop with OpenMP achieved almost the maximum possible speedup for the application.

## How to Apply

The POP website <https://pop-coe.eu> provides more details of the services available and how to apply.

For any queries please get in touch via [pop@bsc.es](mailto:pop@bsc.es)