

**Title of the proposal:**

Implementation to parallel solvers of sparse linear algebra in large application codes and parallel scalability study.

**Hosting team:**P

HiePACS (INRIA Bordeaux- Sud Ouest)

**Context of the research:**

This work will be carried out within the HiePACS Inria team, which specializes in the design and implementation of high-performance software components for numerical simulations. Integration and validation will be carried out in collaboration with partner teams and parallel scalability will be studied on computing platforms in France and Europe. This research work will be carried out within the framework of a European project H2020.

**Missions:**

For many years, the team has been developing important algorithmic know-how for high-performance computing in the MaPHYS (<https://gitlab.inria.fr/solverstack/maphys/maphys/>) and PaStiX (<https://gitlab.inria.fr/solverstack/pastix>) libraries for the resolution of very large parallel hollow linear systems. In particular, these solvers have enabled our users to solve linear systems of equations from applications for real 3D cases efficiently on a large number of processors.

The main tasks are application-oriented:

- In collaboration with a team from CEA and BSC, partners of the European project, participate in the interfacing of these solvers in major application codes of the project. Study the scaling up, identify possible bottlenecks and propose possible remedies.
- Contribute to the development and integration of new numerical methods to improve the numerical behaviour of these solvers while reducing their memory and calculation costs

**Duration:** 12 months, renewal possible.

**Skills and abilities required/desired:**

- Thesis in computational science (applied mathematics, scientific computation or computer science).
- High-performance computing and algorithms; parallel and distributed programming; numerical linear algebra; Fortran/C/C++.

Responsible for supervision and recruitment:

Luc Giraud - [luc.giraud@inria.fr](mailto:luc.giraud@inria.fr)

**Training nature of the experience:**

The techniques to be implemented are cutting-edge R&D techniques and the applications targeted are real complex applications that will have to be implemented on national and European computing platforms.

**Analysis of career prospects:**

The experience acquired will enhance any application for a position related to the fields of distributed computing and high-performance computing.