variants. The general ideas consist in redesigning the algorithms so that the global synchronizations from single right-hand side solver [6, 7] to the multiple-right-hand side framework for GMRES are eliminated. The objective of this post-doctoral project is twofold. First, extend the numerical pipelining ideas so that global synchronizations are removed or hidden. Software implementation design will be organized as well to fully assess the decision made in the numerical and computational aspects.

Supervision: The postdoc will work closely with Emmanuel Agullo and Luc Giraud (HiePACS project team). Some meetings with other Inria teams (current or potential users of the MaPhyS and PaStiX software) will be organized as well to fully assess the decision made in the numerical and implementation design.

Mission confiée
The design of novel algorithms for exascale platforms require to develop novel algorithms that remove or hide the global synchronizations.

Principales activités
The objective of this post-doctoral project is twofold. First, extend the numerical pipelining ideas from single right-hand side solver [6, 7] to the multiple-right-hand side framework for GMRES variants. The general ideas consist in redesigning the algorithms so that the global synchronizations...
involved in the orthonormalization process of the search space can be asynchronously computed while the calculation of the Krylov solver progresses. This task will start by a careful review and analysis of the recent papers published on this topic. It will be followed by the study of the possible ways to extend these ideas first to regular Block GMRES, possible extensions to more advanced numerical solution techniques with inexact breakdowns and spectral deflation at restart might also be considered [4].

In order to assess that the numerical choices allow for large calculations at scale. The second expected contribution is the implementation of these new numerical schemes in our software package Fabulous [1]. The performance validation at scale will be performed via the integration of these new solvers in either MaPhys [2] or PaStiX [3] in application contexts through our collaborations with our industrial partners, namely Airbus, CEA or Total, as well as other Inria teams we collaborate with, namely Magique3D and Nachos.

References:

[1] Fabulous package (hyperlink) - https://gitlab.inria.fr/solverstack/fabulous

Compétences

This position is intended for candidates with a strong background in computational sciences, preferably holding a PhD in applied mathematics or computer science, with some knowledge in numerical linear algebra. A knowledge/experience of parallel programming would also be appreciated.

Avantages sociaux

- Subsidised catering service
- Partially-reimbursed public transport

Rémunération

2653€ / month (before taxes)