MAISON DE LA SIMULATION

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Task based programming model coupled with StarPU runtime for scientific applications

In the framework of EXA2PRO, a recently accepted European FET-HPC project, la Maison de la Simulation proposes **a two years contract** for an High Performance Computing engineer.

The general purpose of the EXA2PRO project is to develop a programming environment that will enable the productive deployment of highly parallel applications in exascale computing systems. Addressing heterogeneous platforms is of course one focus of the project and in particular using a task based programming model coupled with the runtime system StarPU.

The major objective is to introduce task based programming model into the current Fortran implementation of Metalwalls, a molecular dynamic code (~20k lines). This means diving into a production scientific application, introducing StarPU technology and tuning an adhoc task scheduling policy. Extensions of this runtime system technology in collaboration with the StarPU team can be envisaged if it is necessary. This objective will set a performance baseline for such task implementation of the code.

Another smaller objective is to derive a C++ mini application from the Fortran code in order to evaluate the programming environment developed in the framework of the EXA2PRO project on the Metalwalls use case. The objective will be to compare the performance and the software engineering quality of this implementation against the previous one where StarPU is directly and manually integrated in the code.

The recruit will be part of teams of HPC experts from Maison de la Simulation and will work in collaboration with international scientific communities. He/She will have the opportunity to work on the most recent hardware dedicated to scientific computing while contributing to the most advanced tools that deal with runtime systems.

Required skills :

- PhD or master's degree in computer science with a strong connection to HPC ;
- Operational knowledge of techniques and programming language (Fortran90, C or C++) for application development ;
- Experience with developing and running parallel applications using MPI and/or OpenMP ;
- Skills to work in a team.

In addition, knowledge or experience in one of the following domain will be appreciated:

- Task based programming models ;
- Runtime systems in general and StarPU in particular
- Software engineering quality measurement ;

Localisation & starting date:

La Maison de la Simulation is situated on the Saclay research campus in the Digitéo building of the CEA Paris Saclay institute. Starting date is flexible and should be between Oct 2018 and May 2019.

Please send your application (CV, motivation letter et references) as well as your potential requests for additional information to matthieu.haefele@maisondelasimulation.fr

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La Maison de la Simulation :

La Maison de la Simulation is a joint project of five partners (CEA, CNRS, INRIA, University of Orsay and University of Versailles - St Quentin) with the status of a “Service and Research Unit”, whose aim is to support and stimulate the scientific community in order to get the best out of supercomputers, in particular those managed by the French GENCI and the European PRACE programs. La Maison de la Simulation promotes the emergence in France of a HPC community, and develops the strong synergies between researchers and engineers from various fields necessary for the important scientific breakthroughs expected from HPC to materialize. These initiatives are targeted to the current HPC users, as well as to the research of new application fields for the HPC.

To fulfil its missions, la Maison de la Simulation is organized around three axes:

- **A multidisciplinary research centre** focused on numerical simulation. La Maison de la Simulation hosts multidisciplinary research teams working on projects strongly linked to HPC, from mathematics, numerical methods, algorithms, computer science, software engineering to the physics of the studied phenomenon. These teams lead their own research activities and foster the emergence and the usage of common numerical tools.
- **A service and expertise unit** opened to scientific communities. La Maison de la Simulation hosts also a team of HPC specialists able to provide expertise and support to high level application developments to accepted projects. This expertise concerns parallel algorithms, development and optimisation of codes as well as data post-treatment and visualisation.
- **A HPC training centre and scientific animation hub.** La Maison de la Simulation is a HPC training centre and a scientific animation hub on the Saclay research campus that spans, thanks to its regional partners, from initial studies in partnership with universities to in-service training programs.

In order to fulfil its missions, La Maison de la Simulation is made of multidisciplinary teams gathering researchers, assistant professors, engineers, PhD students and post-docs working together on long term activities.