



MAISON DE LA SIMULATION

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Mixed precision implementation for scientific applications running on FPGA with high level languages

In the framework of [EXA2PRO](#), a recently accepted European FET-HPC project, la Maison de la Simulation proposes a **two years contract** for a 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 Maxeler Data Flow Engine computing solution based on FPGA, a promising technology for exascale HPC thanks to its low power requirement.

One objective is to deploy Metalwalls, a molecular dynamic code, on a Maxeler multi-DFE [PRACE](#) platform available at the [Juelich Supercomputing Centre](#). This means diving in a production scientific application and translate the algorithms written in Fortran90 that target classical processors into MaxJ, a high level programming language that target streaming devices like FPGA.

Another objective is to introduce mixed precision algorithms in order to reach the best performance on FPGA. Indeed, double precision computation is very expensive on these devices whereas arbitrary precision computation is available. The goal is to first control the numerical stability of the application in double precision thanks to [CADNA](#), then, to identify code parts that could run with reduced precision while still producing results with a satisfactory accuracy. The development of CADNA extensions will be necessary to meet this challenge.

The recruit will be part of teams of HPC experts from Maison de la Simulation and will work in close collaboration the CADNA developers at LIP6 and with international scientific communities. He/She will have the opportunity to work on the most recent hardwares dedicated to scientific computing while contributing to the most advanced tools that deal with numerical accuracy.

Required skills:

- PhD or master's degree in computer science;
- 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 the following domains will be appreciated:

- FPGA programming;
- computer arithmetic.

Localisation and starting dates:

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 and references) as well as your potential requests for additional information to matthieu.haeefele@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.