2018-00457 - Exascale enabled finite element solvers for nanophotonics

Contract type : Public service fixed-term contract
Renewable contract : Oui
Level of qualifications required : Graduate degree or equivalent
Other valued qualifications : Thèse
Fonction : Temporary scientific engineer
Level of experience : Recently graduated

About the research centre or Inria department

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center's staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)".

Context

Nachos is a joint project-team between Inria and the Jean-Alexandre Dieudonné Mathematics Laboratory at University Nice Sophia Antipolis. The team gathers applied mathematicians and computational scientists who are collaboratively undertaking research activities aiming at the design, analysis, development and application of innovative numerical methods for systems of partial differential equations (PDEs) modelling nanoscale light-matter interaction problems. In this context, the team is developing the DIOGENeS [https://diogenes.inria.fr/] software suite, which implements several Discontinuous Galerkin (DG) type methods tailored to the systems of time- and frequency-domain Maxwell equations possibly coupled to differential equations modeling the behaviour of propagation media at optical frequencies. DIOGENeS is a unique numerical framework leveraging the capabilities of DG techniques for the simulation of multiscale problems relevant tonanophotonics and nanoplasmonics.

Assignment

The team is involved in a recently lauched multi-partner European initiative toward the establishment of a highly productive programming environment for heterogeneous exascale computing. In this context our main objective is to demonstrate that, thanks to the programming models and software tools offered by this environment, we can achieve highly scalable implementations of finite element type solvers for the simulation of nanoscale light/matter interactions that we develop in the framework of the DIOGENeS software suite.

Main activities

More precisely, the successful candidate will be assigned two main missions. On one hand, he/she will leverage advanced programming models and environments developed by other partners of this European project in order to develop accelerator-enabled versions of DG kernels currently exploited in the DIOGENeS software suite. On the other hand, he/she will contribute to the implementation of innovative high order finite element type solvers that are inherently adpated to highly parallel systems. This part of the work will also be conducted in close collaboration with Ph.D and postdoctoral fellows of the team who are currently investigating a new family of highly scalable multiscale finite element solvers for the solution of the PDE modelsrelevant to nanophotonics.

Skills

Candidates will hold a Master degree or a PhD degree in applied mathematics/scientific computing.

Required skills:
- Sound knowledge of numerical analysis and development of finite element type methods for computational physics;
- A concrete experience in numerical modeling for computational electromagnetics will be an asset;

- Strong programming skills and exposure to object-oriented model;

- Knowledge and experience of Fortran 95/2000x;

- Knowledge and experience of MPI, OpenMP and OpenACC;

- Fluent spoken and written English.

Benefits package

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration

General Information

- **Theme/Domain :** Distributed and High Performance Computing
  Scientific computing (BAP E)
- **Town/city :** Sophia Antipolis
- **Inria Center :** CRI Sophia Antipolis - Méditerranée
- **Starting date :** 2019-09-01
- **Duration of contract :** 1 year, 4 months
- **Deadline to apply :** 2019-07-31

Contacts

- **Inria Team :** NACHOS
- **Recruiter :**
  Lanteri Stéphane / stephane.lanteri@inria.fr

About Inria

Inria, the French national research institute for the digital sciences, promotes scientific excellence and technology transfer to maximise its impact. It employs 2,400 people. Its 200 agile project teams, generally with academic partners, involve more than 3,000 scientists in meeting the challenges of computer science and mathematics, often at the interface of other disciplines. Inria works with many companies and has assisted in the creation of over 160 startups. It strives to meet the challenges of the digital transformation of science, society and the economy.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Gross salary : between 2632€ and 2936€ (depends on the experience)