

## 2019-01521 - Post-Doctoral Research Visit F/M Modeling Energy Consumption of Heterogeneous Numerical Infrastructures in HPC

**Contract type :** Public service fixed-term contract  
**Level of qualifications required :** PhD or equivalent  
**Fonction :** Post-Doctoral Research Visit

### About the research centre or Inria department

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.

### Assignment

Energy consumption is one of the main limiting factor for the design and deployment of large scale numerical infrastructures [4]. The road towards "Sustainable Exascale" is a challenge with a target of 50 Gflops per watt. Energy efficiency must be taken into account and must be combined with other criteria like performance, resilience, quality of service. In particular, power consumption is critical and power peaks should be avoided to ensure the proper power supply of the large-scale infrastructure [2].

As platforms become more and more heterogeneous (co-processors, GPUs, low power processors...), a deep understanding on how application and services can efficiently run on such large scale infrastructures remains a challenge. Simulation of infrastructures (like by using the SimGrid framework [1]) makes a significant step towards this direction.

The post-doc will explore the energy consumption issues in large scale high performance heterogeneous computing platforms by measuring the actual energy consumption on real infrastructures (including Grid'5000 test-beds), and proposing end-to-end energy models for large-scale HPC infrastructures. These models will account for data movement and computations. Their integration within the SimGrid framework will allow to test what-if scenarios in order to determine for given HPC applications what would be the most suitable hardware architecture in terms of computation cores and network configuration.

Several performance and energy models will be explored depending on targeted computing resources mixing simulated GPUs and low power processors. The post-doc will manage, propose and analyze several experimental scenarios in order to validate proposed solutions and to design energy-efficient HPC applications.

The candidate will be located in Inria Myriads team (IRISA, Rennes, Anne-Cécile Orgerie as principal advisor) and co-advised with the Avalon team (LIP, Lyon with Laurent Lefevre co-advisor). This thesis will be part of the Inria International Project Lab HAC Specis (High-performance Application and Computers, Studying PErformance and Correctness In Simulation)[3].

References :

[1] - SimGrid : <http://simgrid.gforge.inria.fr/>

[2] - Kun Tang, Devesh Tiwari, Saurabh Gupta, Ping Huang, Qi Lu, Christian Engelmann, and Xubin He, "Power-capping Aware Checkpointing: On the Interplay among Power-capping, Temperature, Reliability, Performance, and Energy", IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), 2016.

[3] - IPL HAC Specis : <http://hacspecis.gforge.inria.fr/>

[4] - Anne-Cécile Orgerie, Marcos Dias de Assunção and Laurent Lefèvre, "A Survey on Techniques for Improving the Energy Efficiency of Large Scale Distributed Systems", ACM Computing Surveys, Volume 46, Issue 4, December 2014

### Main activities

The post-doc will explore the energy consumption issues in large scale high performance heterogeneous computing platforms by measuring the actual energy consumption on real infrastructures (including Grid'5000 test-beds), and proposing end-to-end energy models for large-scale HPC infrastructures.

### Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours)
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

### Remuneration

Monthly gross salary amounting to 2653 euros.

### General Information

- **Theme/Domain :** Distributed Systems and middleware  
System & Networks (BAP E)
- **Town/city :** Rennes
- **Inria Center :** CRI Rennes - Bretagne Atlantique
- **Starting date :** 2019-06-01
- **Duration of contract :** 1 year, 6 months
- **Deadline to apply :** 2019-05-31

### Contacts

- **Inria Team :** MYRIADS
- **Recruiter :**  
Orgerie Anne-cécile / [anne-cecile.orgerie@inria.fr](mailto:anne-cecile.orgerie@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

Please submit online : your resume, cover letter and letters of recommendation eventually

For more information, please contact [anne-cecile.orgerie@inria.fr](mailto:anne-cecile.orgerie@inria.fr)

#### 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.