Multi-objective resource allocation in modern distributed infrastructures

**DATAMOVE - PHD Campaign - Campagne Doctorants Grenoble Rhône-Alpes**

**Contract type:** Public service fixed-term contract  
**Level of qualifications required:** Graduate degree or equivalent  
**Fonction:** PhD Position

### About the research centre or Inria department

Inria, the French national institute for research in computer science and control, is dedicated to fundamental and applied research in information and communication science and technology (ICST). Inria has a workforce of 3,800 people working throughout its eight research centers established in seven regions of France.

Grenoble is the capital city of the French Alps. Combining the urban life-style of southern France with a unique mountain setting, it is ideally situated for outdoor activities. The Grenoble area is today an important centre of industry and science (second largest in France). Dedicated to an ambitious policy in the arts, the city is host to numerous cultural institutions. With 60,000 students (including 6,000 foreign students), Grenoble is the third largest student area in France.

### Context

The candidate will join the DataMove team located in the Grenoble area, France, in the IMAG building (700 avenue Centrale, Domaine Universitaire, 38401 Saint-Martin-d’Hères, France).

### Assignment

We are interested here in accompanying the huge development of the next generation of resource and compute distributed management systems of hybrid Big Data infrastructures, such as data servers, clouds, fog or edge computing. The technology moves fast and we are entering a new age of computing where the Internet of Things deal with petabytes of data while applications from virtual reality, smart cities to autonomous driving need extreme low latency responses. The efficient orchestration of compute workloads executed upon hybrid and complex infrastructures requires the latest innovations from different areas of computer science including stream and batch processing, distributed computing, large-scale system design, security and privacy, user interface design, machine learning, to cite only the most important ones.

Hybrid infrastructures have the characteristic of being composed of heterogeneous multiple computing units and networks, some being very close to the data sources – same building – (known as the Edge), some being geographically close (known as the Fog) and some geographically remote (known as the Cloud). In order to have efficient resource and compute managers on such hybrid distributed infrastructures, it is crucial to decide where computations will take place based on different types of objectives defined by the needs of each application.

The complexity and hybrid nature of big data infrastructures demand the development of multi-objective resource allocation techniques to take into account key parameters such as latency, cost, energy, data locality, security, privacy in order to schedule efficiently the workloads upon the right machines.

### General Information

- **Theme/Domain:** Distributed and High Performance Computing
- **Scientific computing (BAP E)**
- **Town/city:** St Martin d’Hères
- **Inria Center:** CRI Grenoble - Rhône-Alpes
- **Starting date:** 2018-10-01
- **Duration of contract:** 3 years
- **Deadline to apply:** 2018-05-01

### Contacts

- **Inria Team:** DATAMOVE
- **Recruiter:** Trystram Denis / denis.trystram@inria.fr

### Conditions for application

The campaign is not open to local students who have not done any significant mobility.

### 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.

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**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.
Main activities
The objective of this subject is to study different multi-objective scheduling algorithms and to model the hybrid infrastructure ecosystem of a smart building. The focus is to study this distributed system and to develop a prototype that will allow several objectives to be taken into account simultaneously to determine a nearly optimal solution as fast as possible with a low overhead. The proposed study will be finalized with both theoretical analysis of algorithms and performance evaluation results in terms of overhead, efficiency and scalability of the new prototype in a simulated environment.

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours

Remuneration

Monthly salary after taxes: around 1596,05€ for 1st and 2nd year. 1678,99€ for 3rd year. (medical insurance included).