



**Offer #2022-04931**

## **PhD Position F/M Network economics analysis of energy-aware placement of resources**

**Contract type :** Fixed-term contract

**Level of qualifications required :** Graduate degree or equivalent

**Fonction :** PhD Position

### **About the research centre or Inria department**

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

### **Context**

The European Union is willing to design a trusted, best-in-class European-owned software platform for development, deployment and management of applications across the cloud-to-edge continuum, from central infrastructure to devices. It is important to deal with energy efficiency to reduce (or save) electricity consumption and CO<sub>2</sub> emissions to limit global warming. It is typically true due to a massive expected of edge sites submitted to power and heat constraints.

The purpose of this thesis is to analyze strategies of cloud actors, their impact, and regulation procedures which could lead to socially-improved situation. The objective is the optimisation of workload and resources placement for power efficiency.

### **Assignment**

The PhD is part of the E<sup>2</sup>CO Platform project (European Edge Computing platform & services) which aims to develop a highly scalable, federated, trusted edge service platform, supported by an ecosystem of cross-industry users and technology providers.

The PhD will take place will be realized within the Inria Dionysos team, specialized in network economics, one of its main research activities. Network economics can be (and should be) used to understand what happens with entities/operators wishing to optimize their revenue which can be in contradiction with carbon footprint limitation.

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### **Main activities**

The project consists of several actions:

- Model edge nodes and infrastructure costs, interests and goals.
- Use of tools from game theory to determine the best strategies of resource placement and use in the cloud for energy-aware actors.
- Study of what happens if some actors are "energy-compliant" while others are not.
- Then using more precisely mechanism design theory will be considered to determine rules (e.g., regulation) which could be imposed for resource placement and strategies implementing a trade-off between carbon emissions/power saving and quality of service/experience. Financial and technical regulation can be applied and will be studied toward this goal, and compared to determine the best strategy

The output will contribute to:

- Allow for the analysis of the effectiveness of placement strategies before their deployment.
- Investigate appropriate regulation procedures (if needed) towards energy-aware placement strategies.

## Skills

Networking knowledge expected, as well as interest for modeling/performance evaluation.

## 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)
- Possibility of teleworking ( 90 days per year) and flexible organization of working hours
- Social, cultural and sports events and activities
- Partial payment of insurance costs

## Remuneration

Monthly gross salary amounting to :

- 1982 euros for the first and second years and
- 2085 euros for the third year

## General Information

- **Theme/Domain** : Networks and Telecommunications  
System & Networks (BAP E)
- **Town/city** : Rennes
- **Inria Center** : [Centre Inria de l'Université de Rennes](#)
- **Starting date** : 2022-10-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2022-10-15

## Contacts

- **Inria Team** : [DIONYSOS](#)
- **PhD Supervisor** :  
Tuffin Bruno / [bruno.tuffin@inria.fr](mailto:bruno.tuffin@inria.fr)

## About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

**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.

## Instruction to apply

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

For more information, please contact [bruno.tuffin@inria.fr](mailto:bruno.tuffin@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.