



Offer #2023-05764

PhD Position F/M Towards an efficient economic orchestration of 5G and beyond networks

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

5G (and even more Beyond-5G and 6G networks) is expected to increase throughput by a factor up to 100 with respect to 4G, and to allow to connect enormous numbers of devices, from phones to cars and any type of object all over the world. What's more, 5G enables the support of a broad range of services, even the most demanding ones, including real-time interactivity, such as autonomous driving.

The evolution to a network with multiple players offering connectivity and resources across access, edge and core networks from multiple business partners introduces challenging issues about the relations between those actors and the implications on the overall operations of the network. This study is driven by technological propositions, that impact business models and interactions. A typical example is network slicing, aimed at supporting services with heterogeneous constraints, that is also an opportunity for Network Operators (NOs) to get more value out of the transport of services by being part of the content distribution value chain. Network slicing is also seen as one of the most important building blocks for network automation, as it brings more agility in the management of services. Here, an economic model needs to be associated with the technological innovation and its behavior studied in an orchestrated network.

The PhD will be realized within the Ermine Inria team, which has network economics as one of its main research activities, and will be funded by the PEPR 5G project.

Assignment

The goal of the thesis is to identify, to formally define the economic relations between partners, and to embed these aspects in the service offering and provisioning and their associated operation and management. The purpose is to investigate the potential need to regulate the relations towards an efficient orchestration, and compliance to existing legislation, particularly the one around network neutrality: is a technological proposition an infringement to the current legislation, and can it be adapted?

Main activities

The PhD consists in several actions:

- Designing a mathematical model of the interactions in such orchestrated networks, including the technological features;
- Using tools from game theory to determine the best strategies for each actor;
- More precisely, leveraging mechanism design theory to determine rules (e.g., regulation) which could be imposed for an optimal network operation. Economic regulation (based on rule limitations and/or taxes) and technical regulation (on limiting the technologies/algorithms) can be applied and will be studied toward this goal, and compared in order to determine the best strategy.

The output will contribute to:

- Allow for the analysis of the effectiveness of potential strategies before their deployment.
- Investigate appropriate regulation procedures (if needed) towards an efficient orchestration.

Skills

Technical skills and level required : Master

Languages : English.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (90 days per year) and flexible organization of working hours
- Partial payment of insurance costs

Remuneration

monthly gross salary amounting to :

- 2051 euros for the first and second years and
- 2158 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** : 2023-10-02
- **Duration of contract** : 3 years
- **Deadline to apply** : 2023-06-30

Contacts

- **Inria Team** : [ERMINE](#)
- **PhD Supervisor** :
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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.

The keys to success

We are looking for candidates with knowledge in networking and appetencies in modeling, applied mathematics and game theory.

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

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.