The optimization of URLLC IoT protocols thus requires to reshape almost completely the non-human things in real time. Future 5G (and beyond) communications in order to control vehicles, drones, robots and any other complex synchronization, scheduling and coordination. This kind of communication is a key issue for instantaneously a short packet of information in the network, to one or several destinations, avoiding therefore, our objective is to design on-the-fly protocols allowing any radio node to transmit almost any package/model/prototype/application/interface/infrastructure/other specify ***** more specifically dedicated to *****.

About Inria

Inria, the French National Institute for computer science and applied mathematics, promotes “scientific excellence for technology transfer and society”. Graduates from the world’s top universities, Inria’s 2,000 employees rise to the challenges of digital communications. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

The keys to success

The candidate should have earned an MSc degree, or equivalent, in one of the following field: information theory, signal processing, electrical engineering, applied mathematics. He/she should have a strong background in probabilities and information theory as well as in signal processing for wireless communications. He/she can easily manipulate algebra and mathematical analysis, convex or non convex optimization, measure and estimation theory.

The candidate is able to program and to conduct collaborative coding techniques adapted to this new paradigm.

Conditions for application

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). Authorization 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.
communication protocol stack to balance latency and reliability with side constraints such as energy efficiency or computational complexity.

The key elements for these communications are to reduce drastically the needs for synchronization, signalling and detection issues. The packet should be encoded such that all these steps can be performed jointly to avoid costly and long headers to be transmitted.

The proposed approach will rely on estimation theory and hypothesis testing techniques to design new optimal techniques to transmit very short packets (typically less than 100 bits) in a multi-user scenario. The key issue for such problem is to increase diversity at the receiver: multi-antennas reception, opportunistic relaying, joint transmission, multi-user detections are fundamental techniques that have to be reshaped in the context of small packets.

We will take care about the multi-objective framework: increasing reliability should not be done at a high price in terms of complexity or energy efficiency.

The candidate will leverage on recent results in information theory and on hypothesis testing to establish new performance bounds and to derive some fundamental trade-offs (e.g. energy-reliability, latency-reliability, energy-capacity,...), leading to the characterization of optimal multi-user transmission schemes in the Bayesian sens.

This framework will help to design new distributed coding techniques including opportunistic cooperation and relaying. The performance of the proposed algorithms will be confronted to the theory, validated by simulation and experimentally assessed on the plateform FIT/CortXlab.

Some references relative to this topic:


Skills

Technical skills and level required:

- theoretical background: probability and statistics, algebra, functional analysis, optimization theory, signal processing.
- specialization in one of these fields: estimation theory, measure theory, information theory, coding.
- programming: familiar with Matlab, Python or C/C++ languages.
- experience in GNU radio programming is not mandatory but would be appreciated.

Languages:

- English: read/write/speak fluently.
- French is optional.

Relational skills:

- Strong autonomy, innovation, ideas.
- Like to collaborate, to confront ideas.
- Open mind.

Benefits package

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

Remuneration

Gross income: 1982€ the 1st and 2nd year; 2085€ the 3rd year.