The Inria Lille – Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in sixteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Hauts-de-France region, the Inria Lille – Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

Contexte et atouts du poste

The Inria FUN research group investigates solutions to enhance programmability, adaptability and reachability of FUN (Future Ubiquitous Networks) composed of RFID, wireless sensor and robot networks. Limited resources, high mobility and high security level evolving in distrusted environments characterize the objects that compose FUN. They communicate in a wireless way. To be operational and efficient, such networks have to follow some self-organizing rules. Indeed, components of FUN have to be able in a distributed and energy-efficient way to discover the network, self-deploy, communicate, self-structure in spite of their hardware constraints while adapting the environment in which they adapt. For additional information on the FUN research group, please see http://team.inria.fr/fun/

The potential offered by the abundance of sensors, actuators and communications in IoT is hindered by the limited computational capacity of local nodes, making the distribution of computing in time and space a necessity. Several key questions need to be answered to jointly exploit the network, computing and storage resources optimally, accounting at the same time for the trade-offs guaranteeing feasibility for time-critical and mission-critical tasks. Our research takes upon these challenges, by dynamically distributing resources when the demand is rapidly time varying.

Mission confiée

This position falls in the context of the CHIST-ERA DRUID_NET project 2019-2021 which goal is to smartly allocate edge computing resources for dynamic networks in order to improve the global network efficiency and reduce the energy consumption.

In this context, the FUN team is in charge of predicting edge resources requested by wireless devices and deploy accordingly some of them with mobile robots in proper locations.

Principales activités

PhD student will be in charge of:

- Realize a survey of edge gateway dynamic deployments
- Realize a survey of edge resource needs and applications
- Design a dynamic edge resource requirement predictions
- Implement and test the designed solution on real hardware platform
- Participate to the DRUID-NET project (meeting, deliverables, etc)

Time schedule

M1-M6: The PhD student will survey the different kinds of edge resources that may be requested by IoT devices, classify and quantify them. He/She will study the different predictive techniques.

M7-M8: Based on the above mentioned analysis, the PhD will propose an advanced model to predict resources in dynamic IoT networks. In a first stage, the devices will be considered as static.

M9-M12: Implementation and validation of the designed solutions under different settings and IoT devices.

At the end of the first year, the student will be familiar with the edge computing mechanisms from the end-devices perspective. He/She will have designed a first solution for static networks.

M13-M16: Study of different mobility patterns of IoT devices in order to derive a predictive position mechanism.

M16-M20: Integration of the mobility and position prediction in the first solution designed during the first year. Implementation and experimentation.

M20-M24: Integration of heterogenous mobility models in the above designed solution. Implementation and experimentation.

At the end of the second year, the student will have designed a strong mobility-aware edge resource deployment.

M25-M29: Study of mobile edge resource mobility models in order to consider the deployment time in the solutions designed before.

M30-M32: Design of the edge resource deployment

M32-M34: Implementation and experimental validation

M34-M36: PhD report
Compétences

- Knowledge in wireless networks and edge computing
- Skills in Simulation tools and development
- Skills in C and python
- English speaking
- Autonomy
- Open minded
- Team working
- Capacity to write English reports and papers
- Sense of organization, autonomy, rigor

Avantages

- 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 exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of 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

Rémunération

1st and 2nd year : 1 982€ gross monthly salary (before taxes)
3rd year : 2085€ gross monthly salary (before taxes)