



**Offer #2021-03770**

## **Embedded IoT Engineer (M/F)**

**Contract type :** Fixed-term contract

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

**Fonction :** Temporary scientific engineer

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

The Inria Lille - Nord Europe Research Centre was founded in 2008 and employs a staff of 320, including 280 scientists working in fourteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Hauts-De-France région, 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.

### **Context**

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 adapting the environment in which they evolve. For additional information on the FUN research group, please see <http://team.inria.fr/fun/>

In recent years, Ultra-Wide Band (UWB) technology became the basis for radiolocation [1,2] based on distance measurement thanks to the robust estimation of the time of flight between mobile nodes (tags) and fixed nodes (anchors). Unlike RSSI approaches, as used in BLE for example [3,4], the adopted metric is more robust to multipaths and relies on dedicated electronics for clock synchronization and time-of-flight measurement.

Nowadays, it is an integral part of the IEEE 802.15.4 standard at the physical layer and its growth positions it as a new technology in future smartphones. Indeed, it will complement the existing Bluetooth chips by offering a precise distance measurement capability useful for example for tracking [5] (pandemics for example) or any other LBS type application (Location-Based Services). The manufacturer Decawave, the originator of the Scensor radio chips (DWM1000) introduced certified radio modules [6,7] exposing BLE and UWB channels in the same chipset while integrating the antennas.

This opens up new possibilities for the Industrial IoT (IIoT), not only in the industrial world but also beyond. Radiolocation based on distance measurements is a well-studied research topic [8], but we know that a unified approach, as is the case for GPS, is not available off the shelf and that in order to better use to benefit from technology, optimizations must be made to measure according to the targeted application context. In particular, this requires evaluating the performance of distance measurement in the context of the application and designing or even adapting radiolocation algorithms.

In this area, Inria holds two patents [9,10] in the field of radiolocation. The use of [10] would in particular be studied to implement all or part of the solution to the problem of mesh reconstruction by distance measurements.

**References:**

[1] Mendoza-Silva, G. M., Torres-Sospedra, J., & Huerta, J. (2019). A meta-review of indoor positioning systems. *Sensors*, 19(20), 4507.

[2] Ruiz, A. R. J., & Granja, F. S. (2017). Comparing ubisense, bespoon, and decawave uwb location systems: Indoor performance analysis. *IEEE Transactions on Instrumentation and Measurement*, 66(8), 2106-2117.

[3] Thaljaoui, A., Val, T., Nasri, N., & Brulin, D. (2015, March). BLE localization using RSSI measurements and iRingLA. In 2015 IEEE international conference on industrial technology (ICIT) (pp. 2178-2183). IEEE.

[4] Jeon, K. E., She, J., Soonsawad, P., & Ng, P. C. (2018). Ble beacons for internet of things applications: Survey, challenges, and opportunities. *IEEE Internet of Things Journal*, 5(2), 811-828.

[5] Nguyen, C. T., Saputra, Y. M., Van Huynh, N., Nguyen, N. T., Khoa, T. V., Tuan, B. M., ... & Ottersten, B. (2020). A comprehensive survey of enabling and emerging technologies for social distancing — Part I: Fundamentals and enabling technologies. *IEEE Access*, 8, 153479-153507. — Part II: Emerging technologies and open issues. *IEEE Access*, 8, 154209-154236.

[6] Module DWM100, Qorvo. url: <https://www.decawave.com/product/dwm1001-module/>

[7] Simedroni, R., Puschita, E., Palade, T., Dolea, P., Codau, C., Buta, R., & Pastrav, A. (2020, February). Indoor Positioning using Decawave MDEK1001. In 2020 International Workshop on Antenna Technology (iWAT) (pp. 1-4). IEEE.

[8] Brena, R. F., García-Vázquez, J. P., Galván-Tejada, C. E., Muñoz-Rodríguez, D., Vargas-Rosales, C., & Fangmeyer, J. (2017). Evolution of indoor positioning technologies: A survey. *Journal of Sensors*, 2017.

[9] Localisation mono-ancre à réseau d'antennes dans un réseau informatique sans fil. Roudy Dagher, Nathalie Mitton France, N° de brevet : FR1552747. 2015

## Assignment

The Engineer will join a dynamic team of researchers and engineers working on the development of an end-to-end IoT solution for the vertical of maritime transport that is nowadays challenged by the increase of the maritime transport capacity as well as regulation requirements pushing to reduce the environmental impact due to container loss in the sea. The envisioned solution leverages the use of a novel real-time auto-localization with automatic device-container mapping, useful to identify and locate anomaly such as a fire or a fall.

The candidate will lead the hardware and firmware development of the IoT devices at the heart of the proposed IoT platform. This activity is at the core of the solution and combines the BLE Mesh networking and UWB ranging technologies for the network automatic localization in harsh environments with low cost and energy footprint.

## Main activities

The candidate will be in charge of

- Firmware development on top of an embedded RTOS exposing BLE and UWB stacks
- Testbed experiments in the context of the FIT IoT-Lab platform
- Outdoor experiments deployment, evaluation and reference dataset collection
- Hardware prototype design, externalized production follow-up and tests
- Gateway development for integration with the IoT platform in the cloud

## Skills

- Knowledge in wireless sensor networks and experience in one of the following protocols in the framework of the IEEE 802.15.4 standard: BLE, Zigbee, 6LoWPan, 6TiSCH, UWB ranging
- Strong Skills in embedded software development on constrained devices
- Strong Skills in C and python
- Background in electronics: understanding schematics, datasheets
- Understanding of software quality and practice of project management tools such as version control using git, continuous integration, unit tests, etc.

## Benefits package

You will work on emerging research activities with recognized international IoT actors.

You will work in a stimulating and pleasant work environment (transport participation (50%), on-site catering, teleworking, leave and special leave of absence (45 days), video conference equipment, technical laboratory for experimentation ...)

You can benefit from quality training adapted to your needs and skills, whether technical, methodological or linguistic.

In addition to improving your technical skills, Inria offers you the opportunity to develop your

entrepreneurial skills by participating in awareness-raising events and training courses on the creation of start-ups (start-up horizon, intellectual property training, hackAtheC, etc.).  
<https://www.inria.fr/fr/inria-startup-studio>

For international candidates, our administrative services will help you with the various administrative procedures (visa, residence permit, social security, housing, bank, etc.)

## Remuneration

Remuneration according to profile (public service grid)

## General Information

- **Theme/Domain** : Networks and Telecommunications  
System & Networks (BAP E)
- **Town/city** : Villeneuve d'Ascq
- **Inria Center** : [Centre Inria de l'Université de Lille](#)
- **Starting date** : 2021-10-01
- **Duration of contract** : 12 months
- **Deadline to apply** : 2021-08-31

## Contacts

- **Inria Team** : [FUN](#)
- **Recruiter** :  
Mitton Nathalie / [Nathalie.Mitton@inria.fr](mailto:Nathalie.Mitton@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.

## The keys to success

- Professional English speaking and writing
- Autonomy and tech leading
- Open minded and out of the box mindset
- Team working
- Capacity to write English reports and papers
- Sense of organization, autonomy, rigor

**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

### 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.