

6TiSCH Benchmarking

Open Research Engineer/Postdoc position

Admin

- Type of position: Research Engineer or Postdoc (*see below*)
- Location: Inria-Paris, France
- Supervisor: Thomas Watteyne, PhD
thomas.watteyne@inria.fr
- Keywords: 6TiSCH, Embedded, Low-Power Wireless, Experimentation, OpenWSN
- Inria Team: EVA
<https://team.inria.fr/eva/>
- Overarching project: ADT 6TiSCH
- Application deadline: The position is available immediately and needs to be filled quickly. Evaluation of applications will begin immediately and continue until the position is filled.
Candidates are encouraged to apply now.
- Expected start date: ideally 1 February 2018
- Duration: 24 months

Working at Inria

Established in 1967, Inria is the only public research body fully dedicated to computational science. Combining computer sciences with mathematics, Inria's 3,500 researchers strive to invent the digital technologies of the future. Educated at leading international universities, they creatively integrate basic research with applied research and dedicate themselves to solving real problems, collaborating with the main players in public and private research in France and abroad and transferring results innovative companies. Inria researchers have published over 4,500 articles in 2013 and are behind over 270 active patents and 110 start-up companies. In 2013, Inria's budget was 235 million euros, 25% of which represented its own resources. The 180 project teams are distributed in eight research centers located throughout France.

The brand new Inria-Paris research center is located in the heart of Paris. Thanks to its top-quality researchers and numerous international guests, the Inria-Paris research center plays a leading role in international research, with a strong focus on networking and communication systems. The 41 research teams of the center are continuously pushing the boundaries in developing new concepts and techniques.

In 2015, Glassdoor ranked Inria the #1 company in France for the wellbeing of its employees¹.

¹ <http://business.lesechos.fr/directions-ressources-humaines/02180452763-l-inria-l-entreprise-la-plus-soucieuse-de-ses-salaries-111361.php>

EVA (<https://team.inria.fr/eva/>) is a leading research team in low-power wireless communications. The research team is designing Tomorrow's Internet of (Important) Things. The team pushes the limits of low-power wireless mesh networking by applying them to critical applications such as industrial control loops, with harsh reliability, scalability, security and energy constraints. EVA co-chairs the IETF 6TiSCH standardization working group and co-leads Berkeley's OpenWSN project. EVA is also heavily involved in real-world applications, and oversees over 1,000 sensors deployed on 3 continents for smart agriculture, smart city and environmental monitoring applications. The team is associated with Prof. Glaser's (UC Berkeley), Prof. Kerkez' (U. Michigan) and Prof. Krishnamachari's (USC) teams.

Description of the work

This position is part of the ADT 6TiSCH project, funded directly by Inria. 6TiSCH is also the name of a working group at the IETF (<https://tools.ietf.org/wg/6tisch/charters>), which is standardizing a key technology for the Industrial IoT. 6TiSCH is a low-power wireless protocol stack in which nodes are synchronized and use channel hopping. A 6TiSCH network delivers wire-like reliability (>99.999% end-to-end) and over a decade of battery lifetime (with <50uA average current draw). The standardization activities are 80% done, and the pull from open-source/academic communities and commercial/industrial entities is huge.

The overall goal of this project is to lower the barrier to adoption for the industry to be able to move to 6TiSCH, away from wired solutions. This Grand Challenge translates into the following 4 Scientific Objectives:

- Benchmark 6TiSCH by testing it on real use cases and publish results in a reproducible manner.
- Design an architecture and create proof-of-concept implementation of how to integrate 6TiSCH with legacy wired solutions.
- Maintain a reference implementation which is proven to be compliant and interoperable.
- Participate in the 6TiSCH Alliance and IETF 6TiSCH standardization group by collecting requirements and reporting results.

Specific tasks include:

- Get familiar with the OpenWSN (www.openwsn.org) open-source 6TiSCH implementation, and learn how to run a simulation and experiment. Inria-EVA is co-leading the OpenWSN project, so you'll find plenty of people to help you get started.
- Get familiar with the 6TiSCH simulator (<https://bitbucket.org/6tisch/simulator/>), which is Python-based. Inria-EVA co-leads this project, so you'll find plenty of people to help you get started.
- Create a set of scenarios and network requirements that correspond to real use cases. For that, you will be talking to end users, possibly visit deployment sites, on top of finding documented requirements.
- Evaluate the performance of 6TiSCH in these environmental, possible both in simulation and experimentally. For the experimental work, you can use the IoT-lab testbed (<https://www.iot-lab.info/>), a massive 2728-node testbed operated in part by Inria.

Skills and Expertise

We are looking for an advanced engineer or a postdoctoral researcher ready to make a significant contribution to the field of standards-based low-power wireless mesh networking IoT technology:

- The position is open to both Engineers (i.e. you have an Engineer and/or Masters degree) and Postdoctoral researchers (i.e. you have a PhD degree) in Computer Science, Telecommunications, Electrical Engineering or related field.
- We ask for min. 2 years of expertise in low-power wireless networks (mesh networks, WSNs, etc.)
- strong “hard” skills
 - very good programming skills and experience (C/Python/Java, etc.), ideally including web development (server-side, JavaScript, PHP, html, etc.)
 - general understanding of software quality and project management tools (Git, GitHub, Travis-CI, Jenkins, etc)
 - some embedded programming experience (micro-controllers such as MSP430, Cortex-M) ideally involving low-power wireless devices
 - ideally, experience with IoT-related standards such as IEEE802.15.4, IEEE802.15.4e, IETF 6TiSCH, 6LoWPAN, RPL, CoAP, etc.
 - ideally, experience with IoT-related projects such as OpenWSN, RIOT, Contiki, TinyOS
 - ideally, experience with IoT-related testbeds such as FIT/IoT-lab
 - for postdocs, a strong publication track-record and proven expertise in the general topic of IoT
- strong “soft” skills
 - we are looking for the “technical leader” type. If you have participated in open-source projects, have lead a software development team, tell us about it!
 - ideally, some open-source project experience, including source code and project management tools (Git, GitHub, Travis-CI, etc)

Environment

You will work in a fantastically fun environment, within the EVA team (<https://team.inria.fr/eva/>), but also in constant collaboration with other international research teams, through open-source projects, and by interacting with standardization bodies.

You will play an important role in the EVA team. You will be instrumental in the 6TiSCH effort, which is the backbone of the team, and will lead the experimental work. You will be able to interact closely with the IETF standardization process, in particular in the 6TiSCH working group, co-chaired by Thomas Watteyne. This will give you an opportunity to experience the standardization process first-hand and contribute to defining tomorrow’s standards and products.

If you are so inclined, you will have ample opportunity to conduct cutting-edge research (and publish!) around the project, IoT standards and low-power wireless technology, in one of the most vibrant research teams in the field.

Some pointers about the projects the EVA team is involved in:

- Team Homepage: <https://team.inria.fr/eva/>
- Thomas Watteyne's homepage: www.thomaswatteyne.com
- IETF 6TiSCH working group: <https://tools.ietf.org/wg/6tisch/>
- open-source 6TiSCH implementation: www.openwsn.org
- Back-end system: <http://solsystem.io/>
- Smart Agriculture deployment in Argentina: <http://www.savethepeaches.com/>
- Environmental deployment in California: <http://snowhow.io/>
- Smart city deployment in the French Riviera: <http://smartmarina.org/>

Benefits

Located at the heart of Europe, Paris is a unique place to work and live in. Inria offers a unique balance between working in a leading research center and living in one of the most beautiful and bustling cities in the world. A real communication hub, Paris is a gateway to France and Western Europe, and working in the Inria-Paris research center is real asset to your career.

- Competitive salary
- Medical coverage
- approx. 45 days of annual vacation
- Inria covers part of your commute expenses (metro, bus, etc.)
- When needed, Inria will help you apply for Scientific Resident card and a visa
- on-site restaurant (Inria pays for part of you expenses)
- optional French classes (free)

How to apply

Send your CV and cover letter to thomas.watteyne@inria.fr with the subject “[ADT 6TiSCH] application”. Don't hesitate to ask clarifying questions before applying.

Evaluation of applications will begin immediately and continue until the position is filled. **Candidates are encouraged to apply now.**

Note well

- Speaking French is *not* a requirement. Professional proficiency in English is, however, important.
- In the interests of protecting its scientific and technological assets, Inria is a restricted-access establishment. Consequently, it observes special regulations for welcoming foreign visitors from outside of the Schengen area. The final acceptance of each candidate thus depends on applying this security and defense procedure.