2018-00608 - [PostDoc2018-KAIROS-IPLSPAI] Model-Based formal security analysis of IoT systems (around software)

Level of qualifications required: PhD or equivalent
Fonction: Post-Doctoral Research Visit

About the research centre or Inria department

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center’s staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) “Université Côte d'Azur (UCA)”.

Context

A post-doctoral position is opened in the Kairos team (joint between Inria Sophia Méditerranée Centre and UMR 5575 from CNRS/Université de Nice Sophia Antipolis, both in Université Côte d'Azur).

This position is to be funded by the Inria ILP programme, on the SPAI project (Security by Program Analysis in the IoT). Other partners in SPAI are the INDES, ANTIQUE, CELTIQUE and PRIVATICS Inria teams, from several Inria Centres. While other partners will focus on program analysis for IoT-friendly languages, our work will contribute to the analysis of interactions with physical elements through connected sensible objects. Formal abstraction (and possible extensions) of IoT-related standards are to be considered, as well as formal expressions of security provisions and requirements in the augmented setting.

The global objective of the Inria Project Lab SPAI is to combine methods in language design, program analysis, domain-specific property definition and system modeling to study security in IoT systems.

The position is an opportunity to learn about converging topics, where software engineering and system design meet with a common purpose in modeling and analysis of security/safety issues.

The collaboration between teams will materialize in a number of joint meetings, at Inria locations.

Assignment

The post-doc will first deepen his/her knowledge on current research on Language-Based and Model-Based security analysis for IoT systems, specially by studying from the works of SPAI partners (here previous background may be a plus, but assessed ability to cope with such type of research in similar domains may suffice).

Then the post-doc will consider the issue of modeling sensing connected objects (and their controller, or even “digital twins”) in a way compliant with reactive and dynamic programming style as advocated in SPAI. The expression of security properties and contexts will be favored by interactions with experts on such topics from the various partner teams.

While the primary goal is to provide modeling ideas that lead to publications, the construction of prototype tools to support the framework may be considered.

Main activities

See above.

The work will first focus (together with partners) on a loose definition of the requested features for a model of sensing connected objects that will be endowed with executable specification dynamics, so that it may be used in simulation or symbolic execution with the actual software-in-the-loop, with properties run as observers to test security on the combined system of programs with their environment.

General Information

- Theme/Domain: Embedded and Real-time Systems
- Software engineering (BAP E)
- Town/city: Sophia Antipolis
- Inria Center: CRI Sophia Antipolis - Méditerranée
- Starting date: 2018-10-01
- Duration of contract: 12 months
- Deadline to apply: 2018-05-27

Contacts

- Inria Team: KAIROS
- Recruiter: De Simone Robert / robert.de_simone@inria.fr

The keys to success

The candidate should hold a thesis in Computer Science or Software Engineering, and be curious both of formal model-based approaches to program and system verification, a topic made very actual with the boom of embedding software into ordinary-life objects (including smartphones and cars).

Ability to cope with research issues in a collaborative fashion with research teams top-ranked in their fields should provide a momentum for this post-doctoral period. Gain in knowledge and experience should cover different topics, and range from practical language design to formal methods applied on a current hot topic (security of cyber-physical systems).

Conditions for application

Before to apply, it is strongly recommended to contact the scientific in charge of this offer.

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.
Skills
Technical skills and level required:
Languages: English (French may ease comfort of living in Southern French Riviera)
Relational skills: Good ability for team playing (curious, autonomous while not afraid to ask questions if needed)
Other valued appreciated: Correct writing skills for research reports

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

Remuneration
Gross Salary: 2650 brutto per month