2018-00909 - Research engineer in Predictive Security Monitoring for Large-Scale IoT (Knowledge discovery and big data)

Renewable contract : Oui
Level of qualifications required: Graduate degree or equivalent
Fonction : Temporary scientific engineer

Context

The offered position is in the context of SecureIoT
SecureIoT is a European project (http://secureiot.eu/) and a joint effort of global leaders in IoT services and IoT cybersecurity to secure the next generation of dynamic, decentralized IoT systems, that span multiple IoT platforms and networks of smart objects, through implementing a range of predictive IoT security services. It aims to integrate its security services in three different application scenarios in the areas of: Digital Automation in Manufacturing (Industry 4.0), Socially assistive robots for coaching and healthcare and Connected cars and Autonomous Driving.

Assignment

Scientific context

In last years, Internet-of-Things became a reality with numerous protocols, platforms and devices (8) being developed and used to support the growing deployment of smart* services: smart-home, -transport, -health, -city,... and even the rather usual rigid systems with industry 4.0. Providing new services have required first the development of new functionalities with as underlying goals to have more power- and compute- efficient devices which can embed various sensors. Obviously, IoT also supposes a full infrastructure to guarantee the efficiency of communications and processing of information. The embedded devices are thus completed by access points, routers, servers, etc. At the higher levels services are developed and provided to the users. This ecosystem is very rich and cannot be controlled by a unique entity, e.g. services are often developed by third parties, manufacturer of embedded devices are different to those providing connectivity. As a result, such a complex system is naturally a source of potential threats and real cases recently demonstrated their existence by naïve weaknesses (1,6). At Inria, we even demonstrated how simple and cheap it can be to take over the control of a Z-Wave home installation in a silent manner (2). Therefore, security is paramount of importance. In last decade, many IoT architectures have been proposed, such as the reference model IoT-A (3), including security modules. However, as highlighted before, security cannot be guaranteed without failure or by-design and this is all the more true with evolving ecosystems such as IoT with now the emerging trend of using fog-based architecture rather than well-established cloud models. To enhance security, one option is to redesign an IoT architecture with stronger security but this will face the same problems as before, since some security issues can appear afterwards. Maintaining the architecture with new security elements would be then not feasible but a remaining problem is the numerous number protocols or platforms that already exist. Nowadays, the only viable solution is to provide new security mechanisms that could be composed on demand and deployed in any IoT deployment by the operators, the integrators or the vendors rather than developing protocol- or architecture-centric security solutions.

- Missions:
  The main role of Inria in SecureIoT project is (1) to develop a security knowledge database to gather multiple sources of security information (such as those provided by MITRE corporation) and extend automatically knowledge with correlations and (2) define and implement the machine-learning based mechanisms for continuous security monitoring and predictive security of IoT systems. At Inria, the research engineer will be involved in an expert team involving three researchers and one PhD student. The engineer will work in close collaboration with them participating so in the design of solutions for the security of IoT and their implementation.

- Bibliography:

  [5] BF Van Dongen et al., The prom framework: A new era in process mining tool support, ICATPN 2005

Main activities

- Definition of a security knowledge base: the objective is to define and develop all the interfaces and probes to collect identified sources of information (can be attacks, vulnerabilities, threats) to be consolidated in to a single database. The definition of the database includes the selection of technologies to be used and the data representation. In addition, the engineer will be in charge of integrating algorithms produced by researchers aiming at automatically make additional correlations among entities in the database.
- Development of analytics module for monitoring and predictive security. This will be in close collaboration and strong collaborations with Inria researchers and the PhD student working on machine learning techniques. This task will consist in properly integrating developed algorithms in the SecureIoT project platforms as for example by developing necessary probes or interface to collect necessary input data and support other decisions modules with the results.

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 sciences. 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.

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.

General Information

- Theme/Domain : Networks and Telecommunications
- Statistics (Big data) (BAP E)
- Town/city: Villiers-lès-Nancy
- Inria Center : CR Nancy - Grand Est
- Starting date : 2018-09-01
- Duration of contract : 1 year, 3 months
- Deadline to apply : 2018-08-06

Contacts

- Inria Team : RESIST
- Recruiter : Francois Jerome / jerome.francisco@inria.fr

Requirements

- Degree level: Master degree or equivalent
- Experience: 1 year to 3 months
- Graduation: Graduation from a master's degree in computer science and applied mathematics, or a master's degree in telecommunications, or a master's degree in computer science
- Language: Fluent in English
- Virtuosi: Knowledge of Python
- Numerical analysis
- Knowledge of machine learning
- Experience in security

About the company

Inria is a French Research Institute in Computer Science and Applied Mathematics (http://www.inria.fr). Its mission is to produce and transfer cutting-edge research in the digital sciences. With its open, agile model, Inria is a reference model in terms of scientific excellence and transfers innovations that add value and create jobs. Inria is an open innovation laboratory with partnerships in industry and academia and supports more than 2,000 researchers in 112 teams. It hosts 900 Ph.D. and post-doctoral researchers. Inria is the partner of 350 companies, including 170 major companies, and is a member of 600 partnerships with universities, institutions, and international organizations. Inria is also a partner of the leading universities in the world, thanks to its open approach and its ambition to transfer technologies.

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Project management. The research engineer will be fully involved in the project management duties including writing and reviewing of deliverables of the project; participating to the project meetings, including physical meetings being held in different countries of Europe; management of tasks involving multiple partners (for example, other partners will also integrate algorithms in the platform).

Skills
- Required qualification: Diplôme d'Ingénieur, Master degree in Computer Science or Computer engineering
- Languages: Java, python and others are appreciated
- Database and big data technologies: SQL and NoSQL, MongoDB, TinkerPop, Spark, Apache
- Software development: continuous integration and collaborative development using gitlab, knowledge in virtualisation technologies (containers with Docker)
- Knowledge in machine learning and data mining
- Fluent in English (writing and oral communication)
- Comfortable with meetings and webconference situations

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

Remuneration
Monthly gross salary from 2562,00€