2023-06458 - PhD Position F/M Ensuring Availability of Internet-connected Constrained Wireless Networks

Contract type : Fixed-term contract
Level of qualifications required : Graduate degree or equivalent
Function : PhD Position

Context
The PhD position is in the scope of the PEPR 5G project HSec. The HSec project focuses on cyber-security issues in future networks. These networks have played a key role in service delivery for digital infrastructures. These new networking technologies have also penetrated essential and critical services for our daily lives, such as energy, transportation or healthcare.

Assignment
With the global reachability enabled by the IP connectivity, IoT devices are easy Denial-of-Service (DoS) targets. Ensuring service availability has many challenges with battery-powered or energy-harvested IoT devices. Every packet forwarded into the constrained network has an impact on the resource consumption of network nodes. We will study techniques that will enable IoT gateways to filter out the undesired traffic before forwarding it into the IoT network and detect suspicious activity.

Coarse-grained filtering with firewalls or VMs alleviates but does not resolve the problem in the case of internal attackers or compromised hosts. Mechanisms based on state-of-the-art Internet technologies like object security allow us to do much finer control over the traffic that is forwarded into the network. With the gateway in the same security domain as the IoT devices, we can inspect authorization (proof-of-possession) tokens and validate them cryptographically before forwarding the traffic into the network. We aim at enabling true end-to-end IP connectivity of IoT devices, while shielding them from DoS attacks as if they were in a proprietary network.

Main activities
We will design and evaluate architectures and stateful packet filtering techniques. The IoT gateway will enforce the deployed security policies by cryptographically verifying the application traffic origin and its data authenticity.

Skills
- good “hard” skills
  - “computer” programming skills (ideally Python)
  - some embedded programming experience (programming micro-controllers)
  - familiarity with crypto protocols and networking
  - some understanding of software quality and project management tools (e.g. Git, GitHub, Travis-CI, Jenkins)
- good “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 (e.g. Git, GitHub, Travis-CI, etc)
- languages
  - excellent level of English is important
  - speaking French is a plus

Benefits package
- 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

General Information
- Theme/Domain : Networks and Telecommunications
- System & Networks (BAP E)
- Town/city : Paris
- Inria Center : Centre Inria de Paris
- Starting date : 2023-10-01
- Duration of contract : 3 years
- Deadline to apply : 2023-09-30

Contacts
- Inria Team : AIO
- PhD Supervisor : Vucinic Malisa / malisa.vucinic@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.

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.