2018-00728 - Analysis of replicated state machine implementations

Contract type : Internship agreement
Level of qualifications required: A levels + 2 years of higher education or equivalent
Function: Internship Research

Context
The position is within the Static Analysis by Abstract Interpretation team, acronym ANTIQUE (http://www.di.ens.fr/AntiqueTeam.html.fr), which is an Inria-Paris team located at Ecole Normale Superieure in Paris. Our group focuses on developing automated techniques to compute semantic properties of programs and other systems with a computational semantics. The team has a long standing experience in the domain of software verification, with notable successful projects such as Astree, a static analyzer used at large scale for the verification of embedded software.

Static analysis has been applied successfully on sequential code and one of the current challenges is to extend these techniques to distributed computational models, when considering networks of unbounded size.

Assignment
Fault-tolerant distributed algorithms play an important role in many critical/high-availability applications. These algorithms are notoriously difficult to implement correctly, due to asynchronous communication and the occurrence of faults, such as the network dropping messages, processes crashing or behave maliciously. Although fault-tolerant algorithms are at the core of critical applications (Zookeeper, Amazon Dynamo), there are no automated verification techniques that can deal with their complexity.

The difficulty of the verification problem does not only come from the algorithms but also from the way we think about their behaviors. In the team we investigate programming abstractions that facilitate the development of automated verification techniques.

Assignments:
With the help of Cezara Dragoi, the recruited person will be taken to develop to work on an intermediate representation for asynchronous protocols. On the implementation side the intern will work on an a code to code translation from asynchronous java code to the designed intermediate representation.

For a better knowledge of the proposed research subject:
A state of the art, bibliography and scientific references are available at the following URL http://www.di.ens.fr/~cezarad/internship.pdf.

Main activities
Main activities:

- propose solutions for an intermediate representation for asynchronous protocols,
- implement a front-end from Java to the intermediate representation.

Skills
Technical skills and level required: distributed protocols, network programming
Languages: Java, C++, Go

General Information
- Theme/Domain: Proofs and Verification
- Software engineering (BAP E)
- Town/city: Paris
- Inria Center: CRI de Paris
- Starting date: 2018-06-01
- Duration of contract: 4 months
- Deadline to apply: 2018-05-22

Contacts
- Inria Team: ANTIQUE
- Recruiter: Dragoi Cezara / cezara.dragoi@inria.fr

The keys to success
We are looking for enthusiastic students that like network programming and distributed systems. The candidate should enjoy team working and be passionate about learning new concepts.

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 2,700 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). 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:
Benefits package

- Subsidised catering service
- Partially-reimbursed public transport
- Flexible working hours
- Sports facilities

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.