2018-00421 - [Campagne CORDI-S - CRI Paris] : Distributed coordination algorithms in dynamic networks

**Contract type**: Public service fixed-term contract  
**Level of qualifications required**: Graduate degree or equivalent  
**Function**: PhD Position  
**Level of experience**: Recently graduated

**Context**

The Delys group (previously Regal) is a joint team of Inria and Sorbonne University whose research topics cover the whole spectrum of distributed systems and multicore systems. Our research topics span the whole spectrum between theoretical aspects of distributed systems, such as possibility and impossibility results, consensus or fault detectors, to the design and implementation of highly efficient algorithms and systems, such as an extreme-scale geo-replicated database minimising synchronisation. We publish in the best venues across the spectrum, such as PODC, DISC, SSS, OPODIS, JPDC, OSDI, EuroSys, Middleware, SRDS, DSN, IPDPS, EBCC, OSR, Systor, ASPLOS, POPL, etc.

Delys is located at LIP6, the Informatics research laboratory of Sorbonne University, in the Latin Quarter of Paris.

**Assignment**

Distributed algorithms are traditionally conceived for message-passing distributed environments which are static and whose membership is known. However, new environments such as ad-hoc mobile wireless network (MANET) or sensor wireless network (WSN), peer-to-peer networks, and opportunist grids or clouds provide access to services or information regardless of node location, mobility pattern, or global view of the system.

These new systems are dynamic, which means that the communication graph evolves over time, processes might join or leave the system, or crash and recover during the run. Additionally these systems are unknown, which means that processes do not initially know the membership of the system, and only discover it during the run. Therefore, distributed algorithms that run on top of these new systems cannot use prior distributed models for static known systems.

**Main activities**

This thesis focuses on building block algorithms for distributed systems in dynamic topologies, studying fundamental problems such as consensus [1,2] and mutual exclusion [3]. For modeling the dynamics of the system and evolving communication between nodes, we will exploit the formalism of the Time-Varying Graphs (TVG) [4]. Delys has also been interested in failure detector (FD) [5] which is a fundamental abstraction for distributed algorithms. FDs have been widely used to solve agreement and locking problems in asynchronous systems prone to crash failures, but usually conceived for static environments and known network topologies. Hence, the objective in this thesis is also to propose efficient FDs algorithms for dynamic unknown networks which will be used to solve agreement and mutual exclusion problems.

Proposed algorithms will be evaluated both on simulation using OMNet ++ tool and in real mobile sensor testbeds using FIT platform.

**References**


**General Information**

- **Theme/Domain**: Distributed Systems and middleware  
- **System & Networks (BAP E)**  
- **Town/city**: Paris  
- **Inria Center**: CRI de Paris  
- **Starting date**: 2018-10-01  
- **Duration of contract**: 3 years  
- **Deadline to apply**: 2018-04-23

**Contacts**

- **Inria Team**: DELYS  
- **Recruiter**: Sens Pierre / pierre.sens@inria.fr

**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.


Skills
The candidate should have knowledge in distributed systems and theoretical aspects of distributed algorithms as well as strong development skills since interest in experimental research is also requested.

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport

Remuneration
Gross Salary per month: 1 982 € the first 2 years and 2 085 € the last year