Offer #2024-07163

PhD Position F/M Design and compilation of a mixed synchronous/asynchronous data-flow language

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

Context

The PhD thesis is funded by the University of Lille and will take place at the CRIStAL and INRIA within the INRIA/CRIStAL teams Sycomore and Links.

The supervisors are :

- Julien Forget (Sycomore)
- Patrick Baillot (Sycomore)
- Sylvain Salvati (Links)

Assignment

Synchronous programming is now a well-established programming paradigm in the area of critical embedded systems design. Synchronous semantics is based on solid, elegant and yet simple mathematical foundations, which enable to handle the compilation and verification of a synchronous program in a formal way. In synchronous data-flow languages, such as Lustre, variables and expressions denote infinite sequences of values called flows, and clocks define the rate at which flows produce values. The synchrony constraint essentially requires computations to operate only on flows that have the same clock. Synchrony greatly simplifies system design, however it tends to be overly constraining when considering modern embedded systems. For instance, it is poorly adapted to design systems executed on distributed hardware architectures, systems consisting of several execution modes, or systems that include computations that exhibit large execution time variability. Asynchrony is less constraining but also tends to be less deterministic, which is an important drawback when targeting critical embedded systems.
The objective of this Ph.D. thesis is to design a data-flow language that allows to mix synchronous and asynchronous features in the same program. As we target critical systems, the language semantics, analysis, and compilation will be defined formally.

Main activities

The successful candidate will conduct research on clock type systems and develop the main results

within the Prelude software.

Skills

The candidate should have a good command of English. The PhD will take place in France, though speaking French is not mandatory, it can certainly be of interest for the candidate.

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 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
- Social security coverage

General Information

- **Theme/Domain :** Embedded and Real-time Systems
  Software engineering (BAP E)
- **Town/city :** Villeneuve d'Ascq
- **Inria Center :** Centre Inria de l'Université de Lille
- **Starting date :** 2024-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2024-05-10

Contacts

- **Inria Team :** LINKS
- **PhD Supervisor :**
  Salvati Sylvain / Sylvain.Salvati@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.

The keys to success

The successful candidate is expected to have completed a master in computer science. Knowledge in compilation, type systems and static analysis will be appreciated.

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.