Offre n°2025-08577

PhD Position F/M Design and analysis of parametric adaptive real-time systems

Le descriptif de l'offre ci-dessous est en Anglais

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle

The Inria University of Lille centre, created in 2008, employs 360 people including 305 scientists in 15 research teams. Recognised for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria University of Lille centre pursues a close relationship with large companies and SMEs. By promoting synergies between researchers and industrialists, Inria participates in the transfer of skills and expertise in digital technologies and provides access to the best European and international research for the benefit of innovation and companies, particularly in the region.For more than 10 years, the Inria University of Lille centre has been located at the heart of Lille's university and scientific ecosystem, as well as at the heart of Frenchtech, with a technology showroom based on Avenue de Bretagne in Lille, on the EuraTechnologies site of economic excellence dedicated to information and communication technologies (ICT).

Contexte et atouts du poste

The PhD student will be part of the SyCoMoRES team of Inria Lille & CRIStAL lab, which currently hosts 3 fellow PhD students and one postdoc. Lille is a city close to Brussels, Paris & London, easily reachable by train, with a large student population and a number of cultural places & events.

PhD students are appointed for a duration of 3 years. We plan to organize weekly

research meetings with the PhD student.

Mission confiée

A real-time system controls a physical device in its environment, at a rate adapted to the device evolution. This requires not only to compute correct values, but also to compute values at the right time. Real-time systems can be found in several industrial domains, such as automotive, aeronautics, nuclear plants or automated production lines.

A real-time system is usually represented as a set of concurrent tasks subject to timing constraints (deadlines). In order to guarantee the respect of timing constraints, first a worst-case execution time (WCET) analysis is performed. Then, this information is used to perform a schedulability analysis so as to guarantee that all tasks will meet their deadlines, when executed concurrently at run-time.

While WCET is usually computed as a constant value, an alternatice is to compute a WCET formula that depends on various parameters of the system, for instance procedure arguments. This has several important benefits, such as enabling modular WCET analysis, component reuse, library or system call integration, or development of adaptive real-time systems.

The objective of the thesis is to contribute to a novel design and analysis methodology for adaptive real-time systems based on parametric WCET. The applicant will investigate one or several of the following research directions.

First, sensitivity analysis could be used to compute the intervals of admissible values of the execution time that make the system schedulable. Second, we could propose a sensitivity analysis based on admissible procedure argument values, instead of execution times. Finally, WCET formulas can be instantiated at run-time, at which point parameter values become known, to implement an adaptive scheduler that takes it decisions based on the current value of the instantiated WCET. In particular, a promising research direction would be to extend resource reservation algorithms with a semi-clairvoyant scheduling approach.

Principales activités

The following activities will be carried out during the thesis:

- Bibliographic research;
- Proposing solutions for the identified research directions;
- Writing research papers on the thesis results;
- Teaching (optional)

Compétences

Technical skills: a good background on computer science and embedded systems.

Languages: English. French is *not* required.

Other valued, appreciated: real-time systems, theoretical computer science. Autonomy.

Avantages

- 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

Informations générales

- **Thème/Domaine :** Systèmes embarqués et temps réel
  Plateformes expérimentales logiciel (BAP E)
- **Ville :** Villeneuve d'Ascq
- **Centre Inria :** Centre Inria de l'Université de Lille
- **Date de prise de fonction souhaitée :** 2025-09-01
- **Durée de contrat :** 3 ans
- **Date limite pour postuler :** 2025-04-30

Contacts

- **Équipe Inria :** SYCOMORES
- **Directeur de thèse :**
  Forget Julien / julien.forget@inria.fr

A propos d'Inria

Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut fait appel à de nombreux talents dans plus d’une quarantaine de métiers différents. 900 personnels d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'e?orce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

- Curiosity;
- Enjoying intellectual stimulation and facing new challenges

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

Sécurité défense :
Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

Politique de recrutement :
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.