



Offre n°2024-07935

Characterization of energy-aware design for battery-less devices

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

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Ingénieur scientifique contractuel

Niveau d'expérience souhaité : De 3 à 5 ans

A propos du centre ou de la direction fonctionnelle

The Inria Centre at Rennes University is one of Inria's eight centres and has more than thirty research teams. The Inria Centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Contexte et atouts du poste

The NOP project is funded by LabEx Cominlabs for the period 09/2021-12/2024. It aims to design energy-aware building blocks for autonomous IoT platforms that are self-powered by ambient energy harvesting, with applications in the field of smart sensors.

The consortium consists of four teams with complementary skills: ASIC (IETR): ultra-low power architecture ; Granit (IRISA): digital communication and autonomous networked objects; PACAP (Inria): compilation and real-time systems; STR (LS2N): embedded software.

28 months after the start of the project, several milestones have been reached. A formal model adapted to the description of intermittent reactive systems has been proposed. This model was used to formalize and solve the optimal scheduling problem in an energy-aware intermittent system. These results have then been used as the basis of the implementation of the first energy-aware RTOS dedicated to intermittent systems. In parallel, a dedicated compile-time code optimization technique has been designed. By optimizing jointly memory mapping and checkpoint placement, it provides very significant energy savings.

Efforts are currently focused on the development of the demonstration platform and the application. For the platform, the hardware design has been validated and production is in progress. For the application, software prototypes have been developed, feasibility has been validated and relevant software components have been identified: pre-processing, neural network, classification, and transmission.

Mission confiée

One of the main bets of the NOP project is that the cost of implementing an energy-aware approach will be less than the benefits obtained. The evaluations carried out so far, both at runtime and at compiler level, show very significant gains indeed, far greater than the additional overheads. However, what is not currently planned in the project roadmap is a more detailed evaluation covering the whole platform over its entire lifecycle.

Specifically, we identify three main cost/benefit trade-offs that need to be assessed:

- Design phase: additional development time to characterize the energy models of hardware and software components vs. gain from transparent implementation (for the developer) of intermittency support mechanisms.
- Operation phase: consumption of resources required for on-line measurements and decisions vs. absence of code replay, minimization of checkpoints, and optimization of sleep times.
- Late operation phase: sensitivity of energy-aware vs. energy-blind intermittent systems to component ageing.

Principales activités

As far as exploring runtime trade-offs is concerned, we believe that the trade-offs can vary quite a lot depending on the profile of the application. A very simple application of the sensor-digitization-transmission type is unlikely to benefit as much from the gains offered by the energy-aware approach as a more complex application involving, for example, additional stages of classification, anonymization or encryption, or a more reactive application with quality of service constraints.

We therefore propose to develop a set of benchmarks corresponding to different application profiles. Proposing such benchmarks will be a first contribution to the state of the art. We will use these benchmarks to finely characterize the different costs associated with managing intermittent performance with our approach, as well as approaches that are representative of the state of the art, both at runtime and at compilation level.

Compétences

Technical skills and level required:

- proficiency in C and C++ languages is required
- understanding of assembly language is a plus

Languages: English (read, written, spoken)

Relational skills: ability to work in a team

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (90 days per year) and flexible organization of working hours
- Partial payment of insurance costs

Rémunération

Monthly gross salary from 2695 euros based on experience

Informations générales

- **Thème/Domaine** : Architecture, langages et compilation
Ingénierie logicielle (BAP E)
- **Ville** : Rennes
- **Centre Inria** : [Centre Inria de l'Université de Rennes](#)
- **Date de prise de fonction souhaitée** :2024-10-01
- **Durée de contrat** :6 mois
- **Date limite pour postuler** :2024-09-04

Contacts

- **Équipe Inria** : [PACAP](#)
- **Recruteur** :
Rohou Erven / erven.rohou@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'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

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Consignes pour postuler

Please submit online : your resume, cover letter and letters of recommendation eventually

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 :

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