Autonomic, self-adaptive and reconfigurable computing systems are required in smart environments like CPS, because they have the ability to adapt to their environment in order to achieve a set of objectives (e.g., comfort, security and energy savings). This is done by changing their architecture configuration and behavior upon the occurrence of specific events. Building such systems requires to design and implement autonomic feedback loops that collect events and measurements, make decisions and execute the corresponding actions. The design and the implementation of such loops are made difficult by several factors: the complexity of systems with multiple objectives, the risk of conflicting decisions between multiple loops, the inconsistencies that can result from communication errors and hardware failures and the heterogeneity of the devices. Proposals have been made [1,2,4] to design frameworks for reliable and self-adaptive systems, where multiple autonomic loops can be composed into complex managers, with application to smart environments.

The research to be done takes place in the H2020 project CPS4EU, more particularly in Work Packages concerning CPS collaborative systems, and CPS for “Smart-Grid” use cases. It will be done in cooperation with our industrial partner RTE in Paris.

Mission confiée
The objective is to contribute to the software architecture, on top of the middleware platform at RTE, in order to support the cooperation and coordination of multiple management and control loops, some concerning the physical systems, others the management of the middleware and the loop processes themselves.

Principal activités
The work will involve to:
- study and analyze a state of the art in middleware support for CPS, their requirements for different classes of applications, their functionalities and characteristics, the guarantees and properties offered, and the ability to self-adapt;
- identify the requirements and build the specification of a middleware framework for supporting dynamic adaptations by feedback loops, at applicative level (e.g. related to the physical process) or infrastructure level (monitoring HW/SW architecture, load and performance, and acting by reconfiguration and redeployment of resources and components), on the basis of the RTE middleware, and taking into consideration the application domain of energy distribution and smart grids;
- considering coordination of multiple subsystems, instrumented with sensors and actuators, managed by their feedback loops, combining dynamic adaptations between

Informations générales
- Thème/Domaine : Systèmes distribués et intergiciels
- Ville : Grenoble
- Centre Inria : CRI Grenoble - Rhône-Alpes
- Date de prise de fonction souhaitée : 2020-01-01
- Durée de contrat : 2 ans
- Date limite pour postuler : 2019-12-31

Contacts
- Equipe Inria : CTRL-A
- Recruteur : Rutten Eric / eric.rutten@inria.fr

A propos d'Inria
Inria, l'institut national de recherche dédié aux sciences du numérique, promeut l'excellence scientifique et le transfert pour avoir le plus grand impact. Il emploie 2400 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3000 scientifiques pour relever les défis des sciences informatiques et mathématiques, souvent à l'interface d'autres disciplines. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 160 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.

L'essentiel pour réussir
An interest for cooperation with an industrial partner, and development and experimental work is particularly relevant to this position.

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.

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.
subsystems, or between controllers of different types (logical, quantitative, probabilistic);

- instantiate the framework in an operational environment for experimental validation: study and experiment different architectures of cooperation of decentralized systems, safety and security issues, architecture and system analysis, orchestration and validation of systems definition of interaction, communication and collaboration mechanisms of a framework for Cyber Physical System of Systems.

Compétences
Expected technical competences are amongst the following:

- Middleware design,
- Self-adaptive systems,
- Autonomic computing,
- Software architectures

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 (after 6 months of employment) 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

Rémunération
Gross salary: 2 653 euros (before income taxes)