2020-02547 - PhD Position F/M [Cordi-S Campaign 2020] Efficient Component-based Reconfiguration Planing and Modeling in Large Scale Systems

Type de contrat : CDD  
Niveau de diplôme exigé : Bac + 5 ou équivalent  
Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle

Grenoble Rhône-Alpes Research Center groups together a few less than 800 people in 38 research teams and 8 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

Contexte et atouts du poste

Avalon project-team

The goal of the Avalon project-team is to execute parallel and/or distributed applications on parallel and/or distributed resources while ensuring user and system objectives with respect to performance, cost, energy, security, etc. Users are generally not interested in the resources used during the execution. Instead, they are interested in how their application is going to be executed: its duration, its cost, the environmental footprint, etc. This vision of utility computing has been strengthened by clouds and fog and by the short lifespans of supercomputers (around three years) compared to application lifespan (tens of years). Therefore a major issue is to design models, systems, and algorithms to execute applications on resources while ensuring user constraints (price, performance, etc.) as well as system administrator constraints (maximizing resource usage, minimizing energy consumption, etc.).

Contexte of this PhD

Distributed systems are continuing to gain importance with the continuous deployment of networks at all scales, from local networks to wide area networks. In recent years, we can for example observe the fast development of Internet of Things, Fog and Edge computing. These infrastructures, as well as the applications that run on top of them, face an increasing complexity stemming from the diversity of hardware, storage, networks, usages, conflicting requirements such as cost versus performance versus energy concerns, etc.

Fast, safe, and efficient deployments and reconfigurations of software (at system and application levels) are needed to meet the requirements of on-demand provisioning, fast response, and more generally agility. Reconconfigurations are classically modeled with a MAPE-K loop [1] (i.e., the Monitor, Analyze, Plan, and Execute phases, plus the Knowledge). This loop implies some sequentiality between the decisions and the actions of the various phases that, unfortunately can lead to some overheads in the cases of fast reconfiguration needs.

In the MAPE-K vision, the Plan phase may in particular require to compute a new mapping of the applications elements onto the resources. Many approaches exists, from the use of a solver to compute an optimal solution, to the use of heuristics or meta-heuristics to deal with the very common situations of NP-complete mapping problems.

The modeling of distributed applications in the context of deployment and reconconfiguration has been a field of a lot of works as illustrated with models such as Fractal/Script [2], Tune [3], Deployware [4], Aeolus [5], Concerto [6], etc. For example, Concerto is a component model that describes the life cycle of each component with a Petri net-like structure, and is able to finely express the dependencies between components. The overall dependency graph it produces is then used to reduce deployment and reconfiguration time by parallelising deployment actions.

Important information concerning the COVID-19 epidemic: in case the rules by the French government and Inria related to the epidemic make it impossible for the candidate to physically start the position at Inria Grenoble, the position will start with teleworking.

Principales activités

PhD objectives

The subject of the proposed PhD consists in revisiting the reconconfigurations models, the component models, as well as the way mappings are computed to deals with the sequentiality of the MAPE-K loop and the distributed nature of the problem to achieve a fast and efficient reconfiguration of distributed systems and applications.

Références


Informations générales

- Thème/Domaine : Calcul distribué et à haute performance  
- Ville : Lyon  
- Centre Inria : CNRS Grenoble - Rhône-Alpes
- Date de prise de fonction souhaitée : 2020-10-01  
- Durée de contrat : 3 ans  
- Date limite pour postuler : 2020-05-26

Contacts

- Équipe Inria : AVALON  
- Directeur de thèse : Pérez Christian / christian.perez@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 200 équipes-projets agiles, en général communes aux partenaires académiques, impliquent plus de 3500 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 personnes 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 180 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

- Very good communication skills in oral and written English.
- Open-mindedness, strong integration skills and team spirit

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 à régime restrictif (ZRR) doit être déposée en ligne

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


Compétences
- An excellent Master degree in computer science or equivalent
- Strong knowledge of distributed systems
- Ability and motivation to conduct high-quality research and publications
- Strong programming skills (e.g. C/C++, Python)

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
Salary (before taxes) : 1982€ gross/month for 1st and 2nd year. 2085€ gross/month for 3rd year.