



Offre n°2023-06679

PhD Position F/M Optimizing multi-domain E2E services orchestration

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

A propos du centre ou de la direction fonctionnelle

The Inria centre at Université Côte d'Azur includes 37 research teams and 8 support services. The centre's staff (about 500 people) is made up of scientists of different nationalities, engineers, technicians and administrative staff. The teams are mainly located on the university campuses of Sophia Antipolis and Nice as well as Montpellier, in close collaboration with research and higher education laboratories and establishments (Université Côte d'Azur, CNRS, INRAE, INSERM ...), but also with the regional economic players.

With a presence in the fields of computational neuroscience and biology, data science and modeling, software engineering and certification, as well as collaborative robotics, the Inria Centre at Université Côte d'Azur is a major player in terms of scientific excellence through its results and collaborations at both European and international levels.

Contexte et atouts du poste

Within the framework of a partnership :

- national program PEPR 5G Network of the future (NoF)

Mission confiée

Multiple entities such as Infrastructure Providers (InPs), Mobile Virtual Network Operators (MVNOs), Over-the-top Providers (OTTs), Content Providers (CPs), Service Providers (SPs), Backhaul Operators (BOs), and Vehicular Content Providers (VCPs) have become critical industry players in 5G and beyond slice networks. To build a multi-tenant service management framework for 5G/6G networks, actors and providers need to cooperate, coordinate, and share data and resources with each other, while maintaining a large degree of independence. Moreover, slices may be deployed in a multi-party mode, implying several infrastructures belonging to competing actors [1],[2]. The business processes, policies, and rules defined in different Service Level Agreements (SLA) and contracts of this multi-party context need to govern the framework and drive the networks and infrastructures to realize complex E2E services. In particular, building an end-to-end multi-tenant and multi-party service while respecting its constraints implies to gather highly confidential information from the actors involved, such as their topology or their performance.

The goal of this thesis is to optimize the mapping of multi-actors service requirements to available resources in a multi-party global service architecture while avoiding the exchange of confidential information. To do so, we propose to study the impact of exchanging only abstractions of each domain on the service establishment [3]. A trade-off must then be found between the precision of the information exchanged and the respect of the confidentiality property. The information exchanged must be sufficiently precise to ensure the respect of the service constraints while preventing the deduction of the topology or the performance of a domain. Network abstractions have been studied in the past to reduce the complexity of routing optimization [4][5], focusing on the link resources of the network. This is clearly not addressing slice placement problems that need to consider also node resources. We will investigate how to abstract the network and evaluate the consequence of exchanging network abstractions for the orchestration of services that needs to guaranty E2E QoE, energy consumption, and security. To do so, we will investigate several solutions to abstract a topology using graph theory for example.

Collaboration with Prof. G. Texier, IMT Atlantique, Rennes.

of Network Services Embedding Costs over Public and Private Clouds. ICOIN 2020 - 34th International Conference on Information Networking, Jan 2020, Barcelone, Spain.

[2] Cedric Morin, Géraldine Texier, Christelle Caillouet, Gilles Desmangles, Cao-Thanh Phan. VNF placement algorithms to address the mono- and multi-tenant issues in edge and core networks. CLOUDNET 2019 : 8th IEEE International Conference on Cloud Networking, Nov 2019, Coimbra, Portugal.

[3] Fang Zhou, et al. Methods for network abstraction. 2012. <http://urn.fi/URN:ISBN:978-952-10-8158-3>

[4] Piet Van Mieghem. "Topology information condensation in hierarchical networks." Computer networks 31.20 (1999): 2115-2137.

[5] M. Scharf, T. Voith, M. Stein and V. Hilt, "ATLAS: Accurate Topology Level-of-Detail Abstraction System," 2014 IEEE Network Operations and Management Symposium (NOMS), Krakow, Poland, 2014, pp. 1-5, doi: 10.1109/NOMS.2014.6838357.

Principales activités

- Research
- Present the works' progress to partners of the PEPR 5G NoF
- Feed other PEPR initiatives with the results of this work, especially those producing measurement tools and systems to support energy efficiency and sobriety, resilience and security

Compétences

Skills :

- Networking
- Algorithmic
- Optimization
- Programming skills (Java, C, C++ or 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

Location: Sophia Antipolis, France

Gross Salary per month: 2100€ brut per month (year 1 & 2) and 2190€ brut per month (year 3)

Informations générales

- **Thème/Domaine** : Networks and Telecommunications
System & Networks (BAP E)
- **Ville** : Sophia Antipolis
- **Centre Inria** : [Centre Inria d'Université Côte d'Azur](#)
- **Date de prise de fonction souhaitée** : 2024-09-01
- **Durée de contrat** : 3 years
- **Date limite pour postuler** : 2024-06-30

Contacts

- **Équipe Inria** : [COATI](#)
- **Directeur de thèse** :
Molle Christelle / christelle.caillouet@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.

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.