Offre n°2025-09153

Engineer - Collaborative file system over IPFS

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 : Jeune diplômé

Contexte et atouts du poste

This engineer position will be in the context of Alvearium challenge (https://project.inria.fr/alvearium/), a project between HIVE, Coast, Magellan and Wide Inria teams. The engineer will be located at Inria Nancy-Grand Est and will be visiting Magellan team at Inria Center of the University of Rennes and the Hive offices in Cannes.

About Hive:

Hive intends to play the role of a next generation cloud provider in the context of Web 3.0. Hive aims to exploit the unused capacity of computers to offer the general public a greener and more sovereign alternative to the existing clouds where the true power lies in the hands of the users. It relies both on distributed peer-to-peer networks and on the encryption of end-to-end data.

About Inria Center of the University of Lorraine:

The Inria Center of the University of Lorraine is one of Inria's nine centers and has twenty project teams, located in Nancy, Strasbourg and Saarbrücken. Its activities occupy over 400 people, scientists and research and innovation support staff, including 45 different nationalities. The Inria Center 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 institutes, etc.

About Inria Center of the University of Rennes:

The Inria Center of the University of Rennes is one of Inria's eight centers and has more than thirty research teams. The Inria Center 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 institutes, etc.

Mission confiée

For availability and performance reasons, data is replicated. Several users have to be able to update concurrently the replicas of the same data without losing their modifications. Hive solution relies on IPFS (https://ipfs.io/) and mutable data support is offered by means of the mutable file system API of IPFS. However, there is no support for merging concurrent changes. In the context of Alvearium we proposed using CRDTs (Conflict-free Replicated Data Types) [1] as replication mechanism as they are suitable for end-to-end encryption in a peer-to-peer environment where data will be decrypted only at the receiver side and conflicts can be resolved locally. There is therefore no need to decrypt data during data transmission as it is the case for centralised architectures where servers require un-encrypted data in order to perform merging. There are two main families of CRDTs: state-based and operation-based [1]. They differ in the way payloads are defined, i.e., how the updates are shared. A payload under state-based CRDT contains the whole data, while the payload under operation-based CRDT carries only a single update.

In [2] an operation-based set CRDT was developed over IPFS. The goal of this engineer position is to develop an operation-based file system CRDT whose specification can be inspired from [3,4].

The engineer will closely work together with a PhD student on this topic.

[1] M. Shapiro, N. M. Preguic?a, C. Baquero, and M. Zawirski. “Conflict-Free Replicated Data Types”. In: 13th International Symposium on Stabilization, Safety, and Security of Distributed Systems, SSS 2011. Oct. 2011, pp. 386–400. doi: 10.1007/978-3-642-24550-3_29.

[2] Quentin Acher, Claudia-Lavinia Ignat, Shadi Ibrahim:
Quantifying the Performance of Conflict-free Replicated Data Types in InterPlanetary File System. DICG@Middleware 2023: 19-24

[3] Mehdi Ahmed-Nacer, Stéphane Martin, and Pascal Urso. 2012. File system on CRDT. https://arxiv.org/abs/1207.5990

[4] Vinh Tao, Marc Shapiro, Vianney Rancurel. Merging semantics for conflict updates in geo-distributed file systems. SYSTOR 2015: 10:1-10:12

Principales activités

- Study of literature on CRDTs (1 months)

- Study CRDTs for file systems (2 months)

- Design of an operation-based file system CRDT with merging semantics that satisfy user intentions (6 months)

- Implementation of the proposed CRDT over IPFS (9 months)

Compétences

Engineering and/or Master 2 degree in Computer science / Applied mathematics with an experience in computer networks.
Theoretical expertise: distributed systems, P2P networks

Good collaborative and networking skills, excellent written and oral communication in English
Good programming skills
Strong analytical skills

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

From €2692 gross/month depending on experience and qualifications

Informations générales

- **Thème/Domaine :** Systèmes distribués et intergiciels
  Ingénierie logicielle (BAP E)
- **Ville :** Villers lès Nancy
- **Centre Inria :** Centre Inria de l'Université de Lorraine
- **Date de prise de fonction souhaitée :** 2025-10-01
- **Durée de contrat :** 12 mois
- **Date limite pour postuler :** 2025-08-15

Contacts

- **Équipe Inria :** COAST
- **Recruteur :**
  Ignat Claudia-lavinia / claudia.ignat@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.

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.