Offre n°2024-07093

Post-Doctoral Research Visit F/M [Postdoc] Advancing Space-Terrestrial Integration for IoT: Enhancing Communication Efficiency and Security

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

Type de contrat : CDD

Niveau de diplôme exigé : Thèse ou équivalent

Fonction : Post-Doctorant

Niveau d'expérience souhaité : De 3 à 5 ans

A propos du centre ou de la direction fonctionnelle

The Inria research centre in Lyon is the 9th Inria research centre, formally created in January 2022. It brings together approximately 300 people in 16 research teams and research support services. Its staff are distributed at this stage on 2 campuses: in Villeurbanne La Doua (Centre / INSA Lyon / UCBL) on the one hand, and Lyon Gerland (ENS de Lyon) on the other.

The Lyon centre is active in the fields of software, distributed and high-performance computing, embedded systems, quantum computing and privacy in the digital world, but also in digital health and computational biology.

Contexte et atouts du poste

The postdoctoral position at Inria's AGORA research group, located at the La Doua Campus in Lyon, offers a unique opportunity to collaborate with esteemed experts such as Dr. Juan Fraire Dr. Oana Iova, and Prof. Hervé Rivano. The appointee will use advanced software tools like FloRaSat, an Omnet++-based DTS-IoT simulator, enhancing their expertise in interplanetary communication systems, wireless sensor networks, and urban network planning. This role is enriched by AGORA's strong international and academic-industrial collaborations, including ties with IRIT/ENSEEIHT, i2CAT, Kineis, and Semtech. It offers the chance to delve into the Smart City domain, exploring technologies pivotal to wireless sensor networks and massive machine-to-machine communications. This position is a gateway to cutting-edge research and professional growth in IoT and smart city technologies.

Mission confiée

Context

The Internet of Things (IoT) burgeoning field is transforming with the integration of Space-Terrestrial networks. The STEREO (Space-Terrestrial Integrated Internet of Things) ANR project aims to bridge the gap between terrestrial IoT devices and space-based communication systems. This integration is critical in ensuring seamless connectivity without terrestrial network infrastructure, leveraging Low Earth Orbit (LEO) and Geostationary Earth Orbit (GEO) satellites. The project addresses key challenges such as communication efficiency, latency, atmospheric interference, and orbital mechanics, which are pivotal in achieving a robust and secure IoT network spanning space to Earth. This postdoc position is created to address the challenges in STEREO with a specific focus on optimization and security.

Assignments

This STEREO postdoc proposal encompasses several key assignments:

1. **Optimization of Network Communication**: Developing strategies to enhance communication efficiency between IoT devices and satellites, focusing on overcoming challenges such as varying distances, latency issues, and atmospheric interference.
2. **Satellite-IoT Security**: Addressing vulnerabilities like eavesdropping, signal jamming, identity spoofing, and physical layer attacks through robust security mechanisms such as end-to-end encryption, adaptive frequency hopping, and intrusion detection systems.
3. **Application and Service Development**: Implementing applications and services that leverage optimized network communication and security measures, including enhanced data transfer efficiency, weather-adaptive communication protocols, and low-latency communication paths.
Methodology

1. **Simulation and Analysis**: Conduct extensive simulations to study the impact of different factors like distance, latency, and atmospheric conditions on satellite IoT communications.

2. **Security Protocols Testing**: Testing various security mechanisms like AES-256 encryption, public-key infrastructure, and SSL/TLS protocols in simulated environments to assess their efficacy against potential vulnerabilities.

3. **Application Testing**: Evaluating the performance of developed applications and services under different network conditions to ensure their reliability and efficiency.

References


Principales activités

1. **Research and Development**: Delving into the complexities of satellite IoT communications, focusing on optimizing network communication and enhancing security protocols.
2. **Simulation Execution**: Implement and run simulations to test various aspects of the STEREO network, including communication efficiency and security vulnerabilities.
3. **Data Analysis**: Collect and analyze simulation data to fine-tune communication strategies and security measures.
4. **Application Deployment**: Deploying and testing IoT applications and services in the network to assess their performance and identify areas for improvement.

Compétences

We encourage applications from researchers with a Computer Science or Computer Engineering profile. Practical proficiency with programming languages (C/C++ and Python) is desirable. A solid understanding of mathematics and wireless networking is also preferred. Applicants must have fluency in English; proficiency in French is not a prerequisite but would be advantageous. We are seeking candidates who are empathetic, proactive, and self-motivated.

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 (90 days / year) and flexible organization of working hours (except for intership)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage under conditions

Rémunération

- 2 788 euros gross salary/month

Informations générales

- **Thème/Domaine**: Réseaux et télécommunications
- **Système & réseaux (BAP E)**
- **Ville**: Villeurbanne
• Centre Inria : Centre Inria de Lyon
• Date de prise de fonction souhaitée : 2024-04-01
• Durée de contrat : 2 ans
• Date limite pour postuler : 2024-04-01

Contacts
• Équipe Inria : AGORA
• Recruteur : Fraire Juan Andres / juan.fraire@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.

L'essentiel pour réussir

We seek an intellectually curious and technically skilled collaborator passionate about emerging IoT and satellite communication technologies. The ideal candidate should have a solid telecommunications or networking foundation, proficiency in programming (Python, C++, or similar), and an understanding of machine learning applications. Key personal attributes include resilience, adaptability, effective communication, and teamwork skills.

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

Applications must be submitted online via the Inria website. Processing of applications submitted via other channels is not guaranteed.

Depending on the evolution of the health crisis linked to the Covid 19, it will be possible to take up a teleworking position.

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 Lyon, the position will start with teleworking.

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.