



Offre n°2024-07955

PhD Position F/M Smart IoT networks for a sustainable manufacturing as a service paradigm in Industry 4.0

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

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Doctorant

Contexte et atouts du poste

The potential offered by the abundance of sensors, actuators and communications in IoT is hindered by the limited computational capacity of local nodes, making the distribution of computing in time and space a necessity. Several key questions need to be answered to jointly exploit the network, computing and storage resources optimally, accounting at the same time for the trade-offs guaranteeing feasibility, sustainability and the generation of valuable insights. Our research takes upon these challenges, by dynamically distributing resources with the varying demand flow and available assets.

This position falls in the context of the HE UniMaas Project which aims to deliver a platform for flexible, agile and decentralized manufacturing, embracing the MaaS paradigm (Manufacturing as a service). UniMaas will be built on five main technological pillars: (a) unified on-demand modelling of manufacturing resources and supply chains; (b) intent-based servitization and AI-based estimators; (c) Manufacturing Data Spaces facilitating the interoperable and trustworthy resource servitization; (d) flexible decision making for reconfigurable, circular and sustainable next-generation manufacturing execution systems (MES); and (e) cutting-edge digital technologies for Cloud Manufacturing (CMfg).

In this context, the FUN team is in charge of proposing self-organizing IoT networks allowing the collection of sensitive and real-time data showing the status of manufacturing resources in supply chain as well as the distribution of local decision-making processes based on available resources within the network (IoT - Edge).

Mission confiée

The recruited student will realise their study in the context of the UniMaas project. The aim will be to design an energy-efficient real-time data collection mechanism. This protocol will have to take account of available IoT heterogeneous resources for cloud-based manufacturing resource monitoring.

Particular attention will be paid to quantifying the resource usage efficiency of the data collection, transmission and processing methodologies in relation to the targeted operational objectives.

Principales activités

The PhD student will be in charge of

- Realize a survey on IoT solutions in Cloud Manufacturing, Industry 4.0 and MaaS
- Identify, document and prioritize a set of requirements related to the management of intelligent IoT devices that are used for real-time monitoring of resources (e.g. equipment, technology infrastructure, environmental resource used in production) and assets (factory building, machinery, etc.).
- Propose and implement an energy-efficient real-time data collection mechanism taking into account the available resources of heterogeneous IoT devices allowing cloud-based manufacturing resource monitoring.
- Propose and implement a distributed decision-making mechanism taking into account the available resources at the IoT and Edge and allowing flexible manufacturing resource planning and scheduling
- Participate in the UniMaas project life in interaction with UniMaas partners.

Time schedule

M1-M6 : The PhD student will survey the different kinds of IoT solutions used for Cloud manufacturing, industry 4.0 and MaaS, classify them and deduce management and operational requirements. He/She will study the different IoT self-organizing techniques.

M7-M12 : Based on the above mentioned analysis, the PhD will propose an energy-efficient and real-time data collection mechanism to be used by a network of IoT devices in the context of MaaS.

At the end of the first year, the student will be familiar with the data collection mechanisms from the end-devices perspective. He/She will have designed a first solution for real-time data collection.

M13-M16: Implementation and validation of the designed solutions under different settings and IoT devices.

M16-M20: Study of different resource -based distributed decision-making at the IoT and Edge layers of the IoT network as part of the resource planning and scheduling provided by UniMaaS. Resources here include processing, memory, energy etc. of IoT and edge devices.

M20-M24: Integration of the distributed resource allocation for multi-layer and flexible decision-making with the first solution designed during the first year. Implementation and experimentation.

At the end of the second year, the student will have designed a strong data collection framework and data processing strategy taking into account the MaaS paradigm.

M25-M29: Use of the proposed framework in industry 4.0 and supply chain scenarios featuring MaaS.

M30-M32: Study of limitations and enhancing overall performance by designing and implementing improvements.

M32-M34: Implementation and experimental validation

M34-M36: wrap-up, writing and defense of PhD.

Compétences

- Knowledge in wireless networks (technologies, routing protocols, etc) and edge computing
- Skills in Simulation tools and development
- Skills in C/C++ and python
- English speaking
- Autonomy and curiosity
- Open minded
- Team working
- Capacity to write English reports and papers
- Sense of organization, autonomy, rigor

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 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

Informations générales

- **Thème/Domaine :** Réseaux et télécommunications
- **Ville :** Villeneuve d'Ascq
- **Centre Inria :** [Centre Inria de l'Université de Lille](#)
- **Date de prise de fonction souhaitée :** 2024-11-01
- **Durée de contrat :** 3 ans
- **Date limite pour postuler :** 2024-08-09

Contacts

- **Équipe Inria :** [FUN](#)
- **Directeur de thèse :**
Habib Carol / carol.habib@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 are looking for a candidate that owns a Master in computer science, who is creative in proposing solutions and capable of critical analysis of results. We demand the student:

1. to be curious and interested in new technologies
2. to have a strong background in IoT and wireless sensor networks
3. to have excellent skills in scripting and programming (e.g., python, C/C++, Java) as well as previous experience with simulation tools
4. to be fluent in spoken and written English with strong communication and presentation skills
5. Experience with energy-efficient data collection, mobility modeling, resource management for wireless networks is considered a plus

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.