



Offer #2024-07557

PhD Position F/M Decentralized semantic data sharing with access control

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

About the research centre or Inria department

The Inria Saclay-Île-de-France Research Centre was established in 2008. It has developed as part of the Saclay site in partnership with Paris-Saclay University and with the Institut Polytechnique de Paris since 2021.

The centre has 39 project teams, 27 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris. Its activities occupy over 600 scientists and research and innovation support staff, including 54 different nationalities.

Context

Data exchange and sharing is a common need in virtually all modern applications. To achieve interoperability among different, heterogeneous databases, graph databases, and in particular **knowledge graphs**, are preferred due to their flexibility, which enables them to describe different structures of the underlying databases. Knowledge graphs are also naturally suited to be enriched by **ontologies**, which describe the known concepts and properties that hold in a given application domain. **Ontology-Based Data Access (OBDA)** is the name commonly given to data integration systems based on knowledge graphs and ontologies; they have been successfully deployed in a variety of applications.

Our team is a partner in **DXP** (Data Exchange Platform), a collaborative project between several Inria teams and Amadeus, technology provided for the travel industry. Within DXP, we will work to develop **scalable, decentralized, and secure OBDA mechanisms** for exchanging data across the different partners involved in a travel application: providers of services such as transport and lodging, travel operators, individual travelers, etc.

To work on this topic within the DXP project, we are seeking a PhD student with a strong background in computer science, logic, and data management.

Assignment

The PhD student will carry original research work, co-supervised by Ioana Manolescu (Senior researcher at Inria Saclay and Ecole Polytechnique) and Maxime Buron (Assistant Professor at Université Clermont Auvergne).

To start the project, the student will get familiar with the core concepts behind data integration, knowledge graphs, ontology-based data access, on one hand, and mechanisms for secure data sharing, on the other hand, such as those based on contracts and on public/private keys. Of particular interest are decentralized protocols, which, by not relying on a single coordinator, eliminate the risks of a single point of failure, as well as the need of relying on a single trusted partner, a potential vulnerability if that partner is breached.

Then, the student will work to propose novel algorithms for secure data sharing in a decentralized, OBDA-style setting, in collaboration with the supervisors. The student will be mainly responsible for implementing the algorithms, establishing their formal properties, validating their performance experimentally, and interacting with the project partners. The Obi-Wan OBDA system previously developed in the team (see below) will be used as a starting point; it allows flexible integration but has no access control mechanisms. The code resulting from the project will be published in open source.

Depending on the speed of advancement on the above problem, and interest, the PhD may also consider other problems in close scientific areas: heterogeneous data integration, semantic and NLP techniques for data lakes, flexible structured and unstructured graph querying, etc.

For a better knowledge of the proposed research subject :

Obi-Wan (OBDA project previously developed by the team): <https://gitlab.inria.fr/cedar/obi-wan> (see also publications and demonstration video there).

CEDAR team: <https://team.inria.fr/cedar/>

Maxime Buron (LIMOS lab at UCA): <https://perso.limos.fr/~maburon/>

Collaboration :

Claudia-Lavinia Ignat, senior researcher at Inria Nancy, specialized in distributed collaborative systems, and a core partner in DXP, may also be involved to a lesser extent in the supervision.

The CEDAR team is also hiring an engineer on the DXP project. The PhD student will collaborate with the engineer towards delivering solid code as our contributions to the project.

Main activities

The PhD student position involves

- collaborative research work: reading and discussing papers, devising algorithms
- prototyping, developing, and testing algorithm implementation
- discussing progress within and outside of the team, with the project partners and with the scientific community at large
- attending scientific conferences to present the work.

Skills

Technical skills and level required :

Languages :

Relational skills :

Other valued appreciated :

Benefits package

- Subsidized meals
- 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

Remuneration

1st et 2nd year : 2100€ gross/month

3rd année : 2190€ gross/month

General Information

- **Theme/Domain** : Data and Knowledge Representation and Processing Information system (BAP E)
- **Town/city** : Palaiseau
- **Inria Center** : [Centre Inria de Saclay](#)
- **Starting date** : 2024-10-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2024-09-30

Contacts

- **Inria Team** : [CEDAR](#)
- **PhD Supervisor** :
Manolescu Ioana / Ioana.Manolescu@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

There you can provide a "broad outline" of the collaborator you are looking for what you consider to be necessary and sufficient, and which may combine :

- tastes and appetencies,
- area of excellence,
- personality or character traits,
- cross-disciplinary knowledge and expertise...

This section enables the more formal list of skills to be completed and 'lightened' (reduced) :

- "Essential qualities in order to fulfil this assignment are feeling at ease in an environment of scientific dynamics and wanting to learn and listen."
- " Passionate about innovation, with expertise in Ruby on Rails development and strong influencing skills. A thesis in the field of **** is a real asset."

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :

As part of its diversity policy, all Inria positions are accessible to people with disabilities.