



Offer #2022-05131

Post-Doctoral Research Visit F/M Stream data processing in shared Fog environments

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

About the research centre or Inria department

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres 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 institute, etc.

Assignment

Context:

The mutual low-latency objective for both Data Stream Processing (DSP) and Fog environments has resulted in a continuous growth of DSP deployments on Fog environments. The success of DSP deployments in the Fog relies on operators placements and the ability to sustain low latency. Accordingly, much work have focused on placement strategies across Edge-servers or across hybrid Cloud and Edge environments. Previous efforts have focused on reducing the volume of communication overhead between nodes (inter-node communication) and dividing the computation between edge servers and clouds. Unfortunately, they are oblivious to (1) the dynamic nature of data streams (i.e., data volatility and bursts) and to (2) the bandwidth and resource heterogeneity in the Edge, which negatively affects the performance of stream data applications.

Main activities

In a recent work, we addressed the problem of data stream dynamicity. In particular, we showed that Maximum Sustainable Throughput (MST) -- which refers to the amount of data that a DSP system can ingest while keeping stable performance -- should be considered as an optimization objective for operators placements in the Edge. Accordingly, we design and evaluate a MST-driven operators placement (based on constraint programming) for stream data applications [1].

The goal of this post-doctoral project is to investigate how to enable dynamic operators placements in heterogeneous and dynamic environments like Fogs and meet the requirements of diverse stream data applications. Accordingly, we will develop a new scheduling framework (operators' placement) that allows a stream data application to receive the compute and I/O resources it requires to compute, transfer and store data when running in a shared Fog environment. The proposed framework will be integrated in one of state-of-the-art data stream engines such as Flick [2], Storm [3] or Spark [4] and evaluated at large-scale using syntactic applications and real-world stream data application.

[1] Thomas Lambert, David Guyon, and Shadi Ibrahim. 2020. Rethinking Operators Placement of Stream Data Application in the Edge. In The 29th ACM International Conference on Information and Knowledge Management (CIKM '20), October 19–23, 2020, Virtual Event, Ireland.

[2] "Apache flink," <https://flink.apache.org>.

[3] Apache Storm. 2020. <https://storm.apache.org/>

[4] M. Zaharia, T. Das, H. Li, T. Hunter, S. Shenker, and I. Stoica, "Discretized streams: Fault-tolerant streaming computation at scale," in Proceedings of the Twenty-Fourth ACM Symposium on Operating Systems Principles, ser. SOSP '13, 2013, pp. 423–438.

Skills

- A Ph.D. in computer science
- A solid background in the area of distributed systems
- Ability to conduct experimental systems research
- Experience with building systems and tools
- Working experience in the areas of Big Data management, Cloud Computing, Data Analytics are

- advantageous
- Very good communication skills in oral and written English

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT
- Possibility of teleworking (90 days per year) 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
- Partial payment of insurance costs

Remuneration

Monthly gross salary amounting to 2653 euros

General Information

- **Theme/Domain** : Distributed Systems and middleware System & Networks (BAP E)
- **Town/city** : Rennes
- **Inria Center** : [Centre Inria de l'Université de Rennes](#)
- **Starting date** : 2022-08-01
- **Duration of contract** : 1 year, 6 months
- **Deadline to apply** : 2023-01-15

Contacts

- **Inria Team** : [MYRIADS](#)
- **Recruiter** :
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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.

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

Please submit online : your resume, cover letter and letters of recommendation eventually

For more information, please contact shadi.ibrahim@inria.fr

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.