PostDoc/Research Engineer Position
Performance Evaluations of AQMP Alternatives for the OpenStack Ecosystem

About Inria

Inria, the French national institute for research in computer science and control, is dedicated to fundamental and applied research in information and communication science and technology (ICST). Inria has a workforce of 3,800 people working throughout its eight research centers established in seven regions of France.
The candidate will be integrated in the DISCOVERY Inria Project Lab. The actual location can be Nantes (in the ASCOLA team) or Rennes (in the MYRIADS team).

Mission and activities

The position aims at leveraging the EnOS toolkit[1] to evaluate performance of RabbitMQ and some AMQP alternatives in order to identify what is the best solution for WANWide Cloud infrastructures such as the ones envisioned by the Discovery initiative [1] (aka., Fog/Edge Computing infrastructures).

While the model of Cloud computing capabilities provided by a few mega data centers still prevails, the advent of new usages related to Internet of Things applications (IoT) [2], Mobile Edge Computing (MEC) [3] and Network Function Virtualization (NFV) [4] is today strongly challenging this approach.

To cope with this usage change, Cloud and network communities are now advocating for going towards massively distributed small sized infrastructures that are deployed at the edge of the network, thus closer to end- users and their related devices, and applications [5]. Referred to as the Fog/Edge paradigm, this model is attracting growing interest as it also improves services agility. For instance, IoT applications can benefit from the deployment of edge nodes to perform real-time analysis while preserving central data centers for in-depth data analytics. Other applications include CDN (Content Distribution Networks) or even augmented reality [6].

While preliminary results regarding how the DB model of OpenStack can be revised in order to supervise multiple sites [1], the question of the communication bus is still not answered.

The objective of this postdoc position is to investigate the pros and cons of the default AMPQ solution, *i.e,* RabbitMQ, as well as a few other alternatives such as qpid-router at WAN scale.

The work will be structured around three main actions:

- Extend the EnOS toolkit in order to invoke and collect results from dedicated AMQP benchmarks;
- Perform in-vivo experiments with OpenStack/RabbitMQ deployments on top of the Grid'5000 testbed and by emulating several scenarios;
- Conduct similar experiments with AMQP alternatives.

The work will be supervised by Matthieu Simonin (Research Engineer at Inria and Technical leader of the Discovery initiative) and Ronan-Alexandre Cherrueau (Research Engineer at Inria and main developer of the EnOS toolkit). Missions to the Inria research center in Rennes as well as travels to the different OpenStack events should be expected.

[1] http://enos.readthedocs.io/

References

[1] A. Lebre, J. Pastor, A. Simonet and F. Desprez. Revising OpenStack to Operate Fog/Edge Computing Infrastructures. *Proceedings of IEEE International Conference on Cloud Engineering (IC2E) 2017*, April 2017.

[2] L. Atzori, A. Iera, and G. Morabito, "The internet of things: A survey," *Computer networks*, vol. 54, no. 15, pp. 2787–2805, 2010.

[3] A. Ahmed and E. Ahmed, "A survey on mobile edge computing," in *2016 10th International Conference on Intelligent Systems and Control (ISCO)*, Jan 2016, pp. 1–8.

[4] R. Mijumbi, J. Serrat, J.-L. Gorricho, N. Bouten, F. De Turck, and R. Boutaba, "Network function virtualization: State-of-the-art and research challenges," *IEEE Communications Surveys & Tutorials*, vol. 18, no. 1, pp. 236–262, 2015.

[5] F. Bonomi, R. Milito, J. Zhu, and S. Addepalli, "Fog computing and its role in the internet of things," in *Proceedings of the first edition of the MCC workshop on Mobile cloud computing*. ACM, 2012, pp. 13–16.

[6] S. Yi, C. Li, and Q. Li, "A survey of fog computing: Concepts, applications and issues," in *Proceedings of the Workshop on Mobile Big Data*, ser. Mobidata '15. ACM, 2015.

Skills and profiles

Strong programming skills (Python mandatory)
Experimentation skills (in-vivo experiments)
Cloud environments (Knowledge of the OpenStack ecosystem will be definitely an advantage)
Autonomy / Curiosity

English language mandatory

Additional information

The candidates are invited to contact Adrien Lebre (firstname.name@inria.fr).

Duration: 12 months
Location: Nantes or Rennes, France
Salary: 2 621 euros gross/month

Monthly salary after taxes: around 2 127 euros (medical insurance included).