PostDoc Position
Energy/cost-benefit analysis of a decentralized Cloud infrastructure

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 ASCOLA research team localized at the Ecole des Mines de Nantes. However, we underline that the work will be tightly achieved with the MYRIADS research teams localized in Rennes and the French NREN Renater, localized in Paris.

Mission and activities

The postdoc aims at investigating the pros, cons and feasibility of the infrastructure model envisioned by the Discovery initiative [1], in particular from the energy point of view.[1] This model advocates the convergence between data and network centers to deliver efficient and sustainable Cloud Computing platforms.

In order to answer the ever growing demand for Cloud Computing (CC) resources while dealing with energy concerns, the current trend consists in deploying Mega Data Centers (i.e., DCs composed of hundred of thousands resources) in strategic locations presenting energy advantages such as in the vicinity of nuclear power plants [2]. Although this is a concrete solution for CC providers to cope, now, with the demand, alternative solutions addressing sustainability and efficiency will have to be proposed soon.

The concept of micro/nano DCs at the edge of the backbone network is a promising solution. However, operating multiple small DCs breaks somehow the idea of mutualization in terms of physical resources and administration simplicity, making this approach questionable. The Discovery initiative [1] claims that one way to enhance mutualization is to leverage existing network centers, starting from the core nodes of the backbone to the different network access points (a.k.a. PoPs – Points of Presence) in charge of interconnecting public and private institutions. By not requiring the construction of new facilities in isolated places – which means to build huge structures, resulting in wasted amount of time and energy to bring all the needed resources there – and by leveraging resources closer to the end-users, the model envisioned by the Discovery initiative represents a serious opportunity to develop a more sustainable and highly efficient Cloud Computing model. For the sake of simplicity, we will refer to such an “in-network distributed cloud” by the LUC acronym (i.e., Locality-Based Utility Computing).

The objective of this postdoc position is to investigate the pros, cons and feasibility of the LUC infrastructure in terms of energy, performance and financial cost.

The work will be structured around two main actions:

- Analyze the economic/energy costs and benefits of deploying and operating a LUC infrastructure;
- Investigate energy-based policies that can improve the overall energy usage without impacting on the performance of the infrastructure.

[1] http://beyondtheclouds.github.io

References

[1] M. Bertier, F. Desprez, G. Fedak, A. Lebre, A.-C. Orgerie, J. Pastor, F. Quesnel, J. Rouzaud-Cornabas, , and C. Tedeschi. Beyond the clouds: How should next generation utility computing infrastructures be designed? In Z. Mahmood, editor, Cloud Computing: Challenges, Limitations and R&D Solutions. Springer, Computer Communications and Networks, Springer, 2014.

[2] J. V. H. Gary Cook. How dirty is your data ? Greenpeace International Report, 2013.

[3] I. n. Goiri, W. Katsak, K. Le, T. D. Nguyen, and R. Bianchini. Parasol and greenswitch: Managing datacenters powered by renewable energy. SIGARCH Comput. Archit. News, 41(1), Mar. 2013.

[4] A.-C. Orgerie, M. D. d. Assuncao, and L. Lefevre. A Survey on Techniques for Improving the Energy Efficiency of Large-scale Distributed Systems. ACM Comput. Surv., 46(4), Mar. 2014.

Skills and profiles

Strong programming skills (Python and SCALA knowledge will be definitely an advantage)
Experimentation skills (simulation and in-vivo experiments)
Knowledge of Cloud environments
Autonomy / Curiosity

English language mandatory

Additional information

The candidates are invited to contact Adrien Lebre or Anne-Cécile Orgerie before applying (firstname.name@inria.fr).

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

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