Ph.D. position available at LIP6 Laboratory - University Pierre and Marie Curie, France

Subject: "SDN-based Virtual RAN"

Context and Position description:

The computer science laboratory of Paris 6 (LIP6), France, invites applications for a Ph.D. position in the area of Software-defined Virtual RAN. This position is funded by the FUI "Elastic networks" project led by ERCOM.

The project deals with future 5G mobile networks, using the Software Defined Networks (SDN) and Virtual Radio Access Network (VRAN) concepts. SDN is a new networking paradigm facilitating network programmability and network management. It decouples the control plane from the data plane in network equipment, transforming switches and routers into simple forwarding devices that apply rules sent by a remote controller using a standard protocol. On the other hand, VRAN offers the capability of creating multiple instances of RANs upon the same physical equipment and calibrating their capacities on demand. Each instance of VRAN will be associated to one Mobile Virtual Operator (MVO), this way offering the RAN as a Service (RANaaS). Accordingly, available physical resources are exploited by different MVOs, which enhance the revenue of the VRAN provider. Thanks to the virtualization technology, the isolation between VRANs is guaranteed and hence interference probabilities are minimized.

In this context, the thesis research focuses on orchestrating virtual resources (i.e., virtual radio resources, virtual base band units (vBBU), processing power, CPU, memory, network interfaces, etc.) leveraging the SDN concept. Specifically, the focus of the Ph.D. research will be on both algorithmic and practical issues.

From the algorithmic point of view, the challenge will be to design, model, and analyze efficient resource allocation algorithms for the VRAN provider, taking into account several parameters such as, its revenue, the Quality of Service of end-users, energy consumption, and resource availability. Consolidation of virtual machines (i.e., strategic deployment of vBBU for an efficient usage of network resources) is also a challenge to tackle. Indeed, designing and implementing an optimal algorithm in the SDN controller that first consolidates virtual machines (vBBU) to minimize the number of active base stations and, in a second stage, the set of active links and virtual remote radio heads (vRRH) to be turned ON is an interesting avenue to further enhance the performance of virtual RANs.

From a practical point of view, the Ph.D. candidate will implement the proposed algorithms and integrate them in the SDN controller, leveraging open source technologies, such as OpenFlow, Floodlight, and OpenStack, and evaluate their operational efficiency in a real test-bed in collaboration with the different partners of the project.

The selected candidate will be co-supervised by Prof. Rami Langar (University Pierre and Marie Curie - UPMC rami.langar@lip6.fr) and Dr. Nadjib Aitsaadi (University Paris Est Créteil – UPEC nadjib.aitsaadi@u-pec.fr). Short research visit to and collaboration with the group of Prof. Boutaba at the University of Waterloo, Canada are also envisaged.

Requirements:

We are looking for candidates who are self-motivated and would like to conduct high quality research, and publish in top venues. Candidates should have a Master's Degree (or equivalent) in Electrical Engineering, Computer Science, or a closely related area, preferably with a focus on networking or communications. They are also expected to have good analytical skills (Probability Theory, Optimization) and some background in the area of wireless and cellular networking. Good programming skills and experience in popular simulation environments is a plus. Knowledge of French is not required. The position duration is for 3 years.

Environment:

LIP6 is the top-ranked computer science laboratories in France, conducting high quality research in the areas of Computer science, Mobile communication, Networking, Distributed systems, robotics, artificial intelligence, programming language, and software engineering. It is part of the University Pierre and Marie Curie (UPMC) situated in the heart of Paris. UPMC stands for French excellence in science and medicine, and is the 8th European university in the Academic Ranking of World Universities and 41st in the world. More information about LIP6 is available at www.lip6.fr.

Timeline:

- December 1st, 2015: application submissions open
- December 31th, 2015: application submissions deadline
- End of January, 2016: interview of the selected candidates
- February-March 2016: position start date

Application Material:

Interested candidates should send the following documents to the two supervisors listed above:

- 1-2 page summary of research interests.
- Detailed CV including possible publications.
- Names and contact details of at least two referees, who are willing to provide detailed recommendation letters about the candidate.
- Transcripts of courses taken at graduate and undergraduate levels and their grades.

Send your application material via e-mail with the subject line "SDN-based Virtual RAN" to rami.langar@lip6.fr and nadjib.aitsaadi@u-pec.fr