SDN based virtual RAN

Résumé du projet de recherche (Langue 1)

This PhD. proposal 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. 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.

Résumé du projet de recherche (Langue 2)

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. 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.

Informations complémentaires (Langue 1)

Collaborations with Orange Labs and University of Waterloo are envisaged.