ABSTRACT

LIMA, J. L. L. *Minimizing Latency in Cloud RAN Function Placement.* 2018. 51 f. Dissertação (Mestrado em Engenharia Eletrônica) – Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 2018.

Using the processing resources of baseband signals more efficiently and employing a centralized management of the network are major challenges for mobile network operators. To meet the growth of the mobile network demand, cellular network operators need to increase base stations capacities, which are responsible for the network communication with the users. One alternative to perform this expansion is to increase the number of base stations, adding cells with small coverage areas, creating a heterogeneous network infrastructure. In addition, it is possible to provide a centralized processing infrastructure, able to dynamically allocate resources to the stations, reducing the required amount of hardware and increasing the network scalability. Based on this need, the concept of C-RAN (Cloud Radio Access Network) is to execute base station functions in a cloud infrastructure, which can be centralized or composed of several hierarchy levels. The base stations thus act only as signal receivers, which are later processed in the cloud. Given the distance between the cloud and the stations, latency is a critical factor in C-RAN. This dissertation formulates a Mixed Integer Linear Programming problem to choose the placement of radio functions in a C-RAN, while minimizing the latency in a cloud with different hierarchy levels and different processing and transmission capacities. To solve the problem, this work proposes two heuristics, one for networks in which all the links have the same latency and another one for networks in which the links have different latencies. We then show situations in which they reach the optimal result. The first heuristic has complexity $O(n)$, while the second one, which is more general, has complexity $O(n \log n)$.

Keywords: Cloud RAN; Resource allocation; BBU; RRH.