C-RAN: Concepts, Challenges, and Potential Solutions

Dianne S. V. Medeiros and Miguel Elias M. Campista

Universidade Federal do Rio de Janeiro – PEE/COPPE/GTA – DEL/POLI
Rio de Janeiro, RJ - Brazil

E-mails: {dianne, miguel}@gta.ufrj.br

Abstract. *Data traffic growth and the increasing requirement for ubiquitous access to mobile services force network operators to upgrade their infrastructure. Frequently, changes in network infrastructure incur in additional CAPEX (Capital Expenditure) and OPEX (Operating Expenditure), mainly due to equipment acquisition, higher power consumption, and higher maintenance and rental costs. The problem, however, is that such investments are not returning as revenue at the same proportion. As a consequence, network operators are facing more and more challenges with traditional Radio Access Network (RAN) architecture. To address these issues, a new RAN architecture has been searched for. The Cloud-RAN architecture was proposed in 2009, and has been investigated by network operators and academia as a promising alternative. The main purpose of C-RAN is to reduce CAPEX and OPEX, while providing better coverage and capacity for the RAN. To achieve these goals, C-RAN centralizes and virtualizes network functions, simplifying RAN borders. Both centralization and virtualization bring a variety of challenges to this scenario, such as, the need for low cost transport network able to transmit at high rates, real-time cooperative processing algorithms to send and receive data, dynamic radio resource allocation, algorithms for vertical handover, and development of efficient and flexible real-time virtualized operating systems. Network operators claim that C-RAN development is especially important for future deployment of LTE-Advanced and 5G networks. This paper provides an overview on the state-of-the art of C-RAN architecture, covering its concept, features, advantages, challenges, and potential solutions. In addition, it presents recent C-RAN deployments around the world, such as the case studies developed by China Mobile and Korea Telecom.*

Keywords: *C-RAN, Virtualization, Cloudification.*