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Implementation Analysis of Cloud Radio Access Networks Architectures in Small Cells

The main objective of this work was to analyse the performance parameters of a Cloud Radio Access Network in an already deployed LTE-A network of a mobile operator by taking advantage of the functional Remote Radio Head and Baseband Unit split, with the centralisation of the processing power in standard data centres. The work consists of the analysis of the current macro base station location and a list of the possible data centre to present a possible C-RAN deployment under different strategies and algorithms that a mobile operator may be interested in. The metrics studied are fronthaul latency, pool capacity in traffic per hour, processing power capacity and multiplexing gain. A total cost of ownership model is also presented to estimate cost savings possible with the technology. The model is implemented in a computational tool to provide a generic study of any scenario. The results obtained in the central area of Porto have proven that C-RAN implementation with 19 pools is possible without introducing latency problems. In this kind of implementation, the operator can combine different traffic profiles and achieve a multiplexing gain of up to 1.31 that can be translated in capacity savings. A cost reduction of 63 % in capital investment and 31 % in operational expenditures was predicted for a centralised deployment when compared to another green field deployment without centralisation. A futuristic approach was also added to the approach to simulate how massive small cell deployment to handle an 8-time increase in traffic affect the results.

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