World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:07, 2018

Performance Assessment of Carrier Aggregation-Based Indoor Mobile Networks

Authors : Viktor R. Stoynov, Zlatka V. Valkova-Jarvis

Abstract : The intelligent management and optimisation of radio resource technologies will lead to a considerable improvement in the overall performance in Next Generation Networks (NGNs). Carrier Aggregation (CA) technology, also known as Spectrum Aggregation, enables more efficient use of the available spectrum by combining multiple Component Carriers (CCs) in a virtual wideband channel. LTE-A (Long Term Evolution–Advanced) CA technology can combine multiple adjacent or separate CCs in the same band or in different bands. In this way, increased data rates and dynamic load balancing can be achieved, resulting in a more reliable and efficient operation of mobile networks and the enabling of high bandwidth mobile services. In this paper, several distinct CA deployment strategies for the utilisation of spectrum bands are compared in indoor-outdoor scenarios, simulated via the recently-developed Realistic Indoor Environment Generator (RIEG). We analyse the performance of the User Equipment (UE) by integrating the average throughput, the level of fairness of radio resource allocation, and other parameters, into one summative assessment termed a Comparative Factor (CF). In addition, comparison of non-CA and CA indoor mobile networks is carried out under different load conditions: varying numbers and positions of UEs. The experimental results demonstrate that the CA technology can improve network performance, especially in the case of indoor scenarios. Additionally, we show that an increase of carrier frequency does not necessarily lead to improved CF values, due to high wall-penetration losses. The performance of users under bad-channel conditions, often located in the periphery of the cells, can be improved by intelligent CA location. Furthermore, a combination of such a deployment and effective radio resource allocation management with respect to user-fairness plays a crucial role in improving the performance of LTE-A networks.

Keywords : comparative factor, carrier aggregation, indoor mobile network, resource allocation
Conference Title : ICAMTIE 2018 : International Conference on Advanced Materials, Testing and Information Engineering
Conference Location : Zurich, Switzerland
Conference Dates : July 30-31, 2018