Impact of NOMA on network capacity dimensioning for 5G HetNets

Non-orthogonal multiple access (NOMA) has emerged as a key technology for boosting the capacity of 5G networks. Since the latter are expected to be heterogeneous networks (HetNets), the performance of NOMA on 5G HetNets is highly anticipated. In this paper, we present a system-level analysis, focused on the capacity dimensioning, of a 5G HetNet with hybrid multiple access where NOMA and orthogonal multiple access (OMA) coexist. We use dynamic power allocation and consider four generic pairing methods for NOMA: Hungarian, Gale-Shapley, random and exhaustive. Through our results, we show that the optimal or close-to-optimal pairing methods offer the highest capacity gain (22-24%) when the network cells are equally loaded. On the contrary, if the load is unequal and load balancing techniques are used, simpler pairing methods offer higher gains (approximately 29%). This leads to the idea of a flexible choice of the pairing method to be used for NOMA depending on the network load, thus achieving a balance between the network capacity gain and the complexity of the pairing method. In our network, for 100 cells, the combination of the Hungarian and the random method allows supporting 4% higher network traffic volume than if either of these two methods is exclusively used. Such gain can be translated into fewer cells needed for the same traffic volume, or higher traffic volume with the same number of cells. Furthermore, our results on network user dimensioning show that NOMA and HetNets can have the capacity to cope with the high data demand expected for 5G.