Abstract

It is observed that there is limited literature that captures the cellular and D2D performance with ambient load that varies with the time of the day, hence cellular as well as D2D communication performance also varies with time. The performance of cellular and D2D modes for various load conditions need to be analyzed. Besides, most of the insighted D2D enabled networks do not consider the activity factor which in fact is important as D2Ds are based on the concept of reusing the same spectrum as cellular system. This ultimately affects CCI which is the core parameter involved in the F-W analysis of D2D enabled networks. In the first work, we placed eNBs/BSs deterministically with hexagonal cellular boundaries where UEs are distributed in Poisson point process (PPP) fashion and analysed the cellular and D2D performance with load and activity factor. Nevertheless, deterministic placement of BSs and thereby F-W analysis of CCI gave insight into the variation due to load and activity factor, but do not capture spatial randomness as networks are turning into heterogeneous networks (HetNets). To capture the spatial randomness researchers have adopted the stochastic point process to model the location of BSs. We modeled D2D enabled heterogeneous cellular network stochastically using the β-GPP and femtos and D2Ds as PPP distributed and analysed the Hetnet performance.

In the physical layer we used OFDM for cellular and D2D communication. OFDM based systems are inherently associated with transceiver impairments. Using OFDM for D2D communication thereby involves the impact of these transceiver impairments on D2Ds and their feasibility zone of operation. We analysed the impact of these impairments on the cellular and the D2D modes and the zone where D2Ds can be operated under these impairments. Finally, we conclude from the works in the thesis that D2Ds are beneficial at cellular edges in terms of throughput as well as bandwidth requirement and their effectiveness decreases as we move towards the center of the cell. With load the switching distance for D2D mode moves towards edges. We accomplish that load has deteriorating impact on both modes but is passive when D2Ds are edges and highly affected when they are towards the centre of the cell.

Keywords: Cellular load, device-to-device communications, D2D, Long Term Evolution, mode selection, multicellular system, Heterogeneous cellular networks, stochastic modeling, transceiver impairments.