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Exploiting Multichannel Diversity for Cooperative Multicast in Cognitive Radio Mesh Networks

Abstract:

Cognitive radio networks (CRNs) have emerged as a promising, yet challenging, solution to enhance spectrum utilization, thanks to the technology of cognitive radios. A well-known property of CRNs is the potential heterogeneity in channel availability among secondary users. Therefore, multicast throughput in CRNs may suffer from significant degradation because of this property since a link-level broadcast of a frame may only reach a small subset of destinations that are able to receive on the same channel. This may necessitate multiple sequential transmissions of the same frame by the source on different channels to guarantee delivery to all receivers in the destination set. In case of high data generation rate, delivery delay will be high due to the repeated transmissions by the source. In this paper, we propose an assistance strategy to reduce the effect of the channel heterogeneity property on the multicast throughput in cognitive radio wireless mesh networks (CR-WMNs). This assistance strategy is composed of two main activities: first, allowing multicast receivers to assist the source in delivering the data, and second, allowing the transmission of coded packets so that multicast receivers belonging to different multicast groups can decode and extract their data concurrently. Results show that the proposed assistance paradigm reduces multicast time and increases throughput significantly.