ABSTRACT

Routing in multi hop Cognitive Radio Ad Hoc Networks (CRAHNs) faces several new challenges from classical wireless Ad Hoc Networks. First challenge is the lack of Common Control Channel (CCC). CCC is used for supporting transmission coordination and spectrum related information exchange between the Cognitive Radio (CR) users. In absence of CCC, exchange of control message for communication is an extremely challenging task. Secondly, communication in CRAHNs necessitates spectrum awareness. Designing efficient routing solutions for multi-hop CRAHNs requires a tight coupling between the routing module and the spectrum management functionalities which is completely different from traditional wireless Ad Hoc networks. Thirdly, each user in CRAHNs has different set of available channel and these channels may vary dynamically with time and location. Finally, route failure requires effective signaling for reparation broken routes. Due to these new challenges routing protocols present in the literature of classical wireless Ad Hoc Networks are not directly applicable in CRANHs.

This dissertation work investigates the aforementioned challenges and proposes Cognitive Radio Ad-Hoc On-demand Distance Vector (CR-AODV) and Cognitive Radio Ad-Hoc On-demand Multipath Distance Vector (CR-AOMDV) routing protocol considering dynamicity of channel availability in CRAHNs. CR-AODV is extension of existing AODV and CR-AOMDV is adapted from AOMDV routing protocol in wireless Ad Hoc networks. CR-AODV discovers a single path whereas CR-AOMDV discovers multiple paths between a pair of source and destination. Both CR-AODV and CR-AOMDV use channel availability information from lower layer sensing module. Additionally both the protocol store channel information in its routing table for each discovered path along with other routing information. We analyze the performance of both the protocol using Network Simulator (NS-2) considering various routing metrics such as routing overhead, packet delivery ratio, end to end delay and data throughput. Finally, we present performance comparison of both the protocols.

Keywords: Cognitive Radio Ad-Hoc On-demand Distance Vector (CR-AODV), Cognitive Radio Ad-Hoc On-demand Multipath Distance Vector (CR-AOMDV).