

Abstract

Cognitive Radio Networks are a very promising technology which is to be used in the near future as a practical solution to the spectrum shortage problems faced by traditional wireless systems. Emergence of Software Defined Radios has contributed towards the development of flexible cognitive radio transceivers which are capable of dynamically changing their transmission parameters in order to efficiently exploit the available wireless resources. This increased capability of cognitive radios to self adapt based on interactions with the surrounding environment has made the Secondary Users(SUs) for opportunistic spectrum access in those bands that are assigned to primary users(PUs).The PUs are allowed to access their licensed spectrum resources anytime and anywhere, within the specified time limits. Whereas, the SUs have to scan and identify any unused spectrum in the licensed bands. Most importantly, in order not to interfere with PUs, they have to rapidly vacate the licensed spectrum as soon as the PU begins to use its legitimate spectrum resources.

Wireless MAC protocol has a principal part in spectrum reuse and efficiency management. Therefore, various cognitive MAC protocols have been proposed for more flexible and efficient use of spectrum resources. In this dissertation, we have discussed about protocol design both for the synchronous and asynchronous cognitive radio networks with emphasis on the medium access control (MAC) layer. Also we have proposed an Asynchronous Cognitive Radio MAC protocol with CSMA/CA, which integrates the spectrum sensing at physical (PHY) layer and the packet scheduling at MAC layer, for the ad hoc wireless networks. We have simulated it in ns-2.31 and the simulation results have proved that it is coming out with a little bit of improvement over a few existing CR MAC protocols. We have chosen to build an Asynchronous CR MAC protocol because of the extra overhead of synchronization associated with the Synchronous CR MAC protocol.

Keywords: Cognitive Radio, Medium Access Control, Common Control Channel (CCC), Opportunistic Spectrum Access, Software Defined Radios.