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Contents

A Fault-Tolerant Multi-Path Multi-Channel Routing Protocol for Cognitive Radio Ad Hoc Networks

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Abstract. Cognitive Radio (CR) has been proposed as a promising technology to solve the problem of radio spectrum shortage and spectrum underutilization. In Cognitive Radio Ad Hoc Networks (CRAHNs), which operate without centralized infrastructure support, the data routing is one of the most important issues to be taken into account and requires more studies. Moreover, in such networks, a path failure can easily occur during data transmission caused by an activity of licensed users, node mobility, node fault, or link degradation. Also, the network performance is severely degraded due to a large number of path failures. In this paper, the Fault-Tolerant Cognitive Ad-hoc Routing Protocol (FTCARP) is proposed to provide fast and efficient route recovery in presence of path failures during data delivery in CRAHNs. In FTCARP, a backup path is immediately utilized in case a failure occurs over a primary transmission route in order to transfer the next coming data packets without severe service disruption. The protocol uses different route recovery mechanism to handle different cause of a path failure. The performance evaluation is conducted through simulation using NS-2 simulator. The protocol performance is benchmarked against the Dual Diversity Cognitive Ad-hoc Routing Protocol (D2CARP). The simulation results prove that the FTCARP protocol achieves better performance in terms of average throughput and average end-to-end delay as compared to the D2CARP protocol.

Keywords: Multi-path multi-channel routing; Cognitive radio ad hoc network; Fault tolerance; Fast route recovery; Joint path and spectrum diversity

1 Introduction

The recent experiment results conducted by the Federal Communications Commission (FCC) [1] have proved that the static spectrum allocation policy, which allows each

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