

Universiti Teknologi MARA

**Performance Analysis of Dual Diversity Cognitive
Ad Hoc Routing Protocol (D²CARP) for
Cognitive Radio Ad Hoc Network in Terms of
Scalability**

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DECLARATION

I certify that this thesis and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

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ABSTRACT

Advancement of information technology due to the rapid development of online and mobile applications lead to the increasing of mobile devices such as smartphones, tablets, smart TV and etc. Mobile user can have more than one devices to satisfy their needs. As a results, the network traffic will be congested due to current spectrum scarcity. A possible solution to cope with this problem is by implementing Cognitive Radio technology. This technology consists of Cognitive Users (CUs) that are able to utilize to the Primary Users (PUs) licensed spectrum when the spectrum is not occupied by the PUs. This research focuses on routing protocol for Cognitive Radio Ad Hoc Network (CRAHN), an infrastructure-less Cognitive Radio Network (CRN). The routing protocol that is being analysed is Dual Diversity Cognitive Ad Hoc Routing Protocol (D²CARP). D²CARP is a routing protocol that has the capability to route in a multichannel and multipath environment. The objective of this research is to simulate and analyse D²CARP routing protocol in terms of scalability. In order to address the scalability issues, three scenarios of CRN architecture design are analysed which are equal number of radio and channel (Scenario 1), single radio and multichannel (Scenario 2) and equal number of radio and channel (Scenario 3). Each scenario consists of two experiments which are different number of node and different data load. The experiments are simulated using NS2.34 running on Fedora20. The scalability is measured using three performance metrics which are number of hop count, end-to-end delay and routing overhead. Based on experiment of different number of nodes for number of hop count performance metric only Scenario 2 can scale more than 200 nodes. For end-to-end delay only Scenario 1 and Scenario 3 can scale well but for routing overhead there is no significant different among all three scenarios. While for experiment of different data load, it shows that the results for all three performance metrics has no significant different. The overall results show that D²CARP routing protocol cannot cope with the increasing number of nodes only up to 180 nodes in a given CRAHN. Nevertheless, D²CARP can still be implemented if there is an increasing of data load in the network. The future recommendation is to implement the research on a bigger scale with other performance metrics to get better analysis for more precise outcomes and consequently analyse on real network environment.

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