CHANNEL AVAILABILITY AND QUEUING AWARE EARLIEST DEADLINE FIRST SCHEDULING ALGORITHM IN COGNITIVE RADIO NETWORK

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I dedicated this
To my truly loved parents: Omar and Sirad
To my supportive aunts: Shamso and Seynab
To my beloved brothers: Mohamed and Yahye
To my beloved sisters: Najmo, Seynab and Maryan
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Cognitive Radio Networks (CRNs) provide a solution for the spectrum scarcity problem facing modern wireless communications. However, compared with the traditional networks, cognitive radio networks exhibit some distinct features, which result in necessity of further research in the resource allocation and scheduling that have been solved for the traditional networks. The basic concept of CRNs relies on utilizing the unused spectrum of a primary network, without interfering with the activity of primary users (PUs). Therefore, an effective scheduling algorithm is needed in order to manage the opportunistically available resources and provide the necessary Quality of Service (QoS) for different traffic classes for secondary users. In this work, we focus on link queue aware earliest deadline first scheduling in a single cell cognitive radio system. The purpose of this work is to investigate how CAQA-EDF algorithm satisfies the QoS for various secondary user traffic. A buffer selection criterion is introduced together with the channel availability to adjust the priority of different cognitive radio user traffic to be selected for service. Extensive simulations have been carried out and important performance metrics are investigated in the simulation, such as the system throughput, fairness and service delay time and are quantified by the impact of PU channel availability. Simulation result shows that all traffics are scheduled before missing their deadline, despite giving rtPS default scheduling, nrtPS and BE are served before their deadline. In terms of throughput, PU activity effect the overall throughput, the result shows that lower PU active period and high probability of detection with lower false alarm increases the throughput. Finally, fairness is achieved for all traffic and no starvation happened during packet transmission.
ABSTRAK

Rangkaian Radio Kognitif (CRNs) menyediakan satu penyelesaian untuk masalah kekurangan spektrum menghadapi komunikasi tanpa wayar yang moden. Bagaimanapun, berbanding dengan rangkaian tradisional, rangkaian radio kognitif mempamerkan beberapa ciri-ciri yang berbeza, dimana menghasilkan keperluan untuk kajian lanjutan dalam peruntukan sumber dan penjadualan telah diselesaikan untuk rangkaian tradisional. Konsep asas bagi CRN bergantung kepada penggunaan spektrum yang tidak digunakan daripada suatu rangkaian utama, tanpa menganggu aktiviti bagi pengguna utama (PUs). Oleh itu, suatu algoritma penjadualan yang effektif adalah diperlukan untuk menguruskan peluang sumber sedia ada dan menyediakan keperluan kualiti perkhidmatan (QoS) bagi kelas trafiq yang berbeza untuk CRU. Dalam kerja ini, kami fokus kepada ketersediaan saluran dan penjadualan pertama bagi tarikh akhir yang teratur dalam satu sel sistem radio kognitif. Tujuan kerja ini adalah untuk menyiasat bagaimana CAQA-EDF algoritma memenuhi QoS untuk pelbagai trafiq CRU. Suatu kriteria pemilihan buffer adalah memperkenalkan bersama dengan ketersediaan saluran untuk menyesuaikan keutamaan bagi trafiq pengguna radio kognitif yang berbeza dipilih untuk perkhidmatan. Simulasi yang meluas telah dijalankan dan kepentingan prestasi metrik telah dikaji dalam simulasi, seperti hasil sistem, kesamarataan dan penangguhan masa perkhidmatan dan kuantiti, kesan daripada ketersediaan saluran PU. Keputusan simulasi menunjukkan bahawa semua trafiq adalah dijadualkan sebelum ketinggalan tarikh akhir, walaupun diberi penjadualan lalai bagi rtPS, nrtPS dan BE berkhismat sebelum tarikh akhir. Dalam bentuk hasil, aktiviti PU memberi kesan kepada keseluruhan hasil, keputusan menunjukkan bahawa tempoh aktif PU yang rendah dan keberangkalian yang tinggi bagi pengesanan dengan keberangkalian yang rendah bagi penggera kesalahan akan meningkatkan hasil. Akhirnya, kesamarataan telah dicapai untuk semua trafiq dan tiada ketidakcukupan yang berlaku semasa penghantaran paket.