

Scheduling Algorithms for Dynamic Spectrum Sharing

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Abstract

The *secondary service* is able to access the spectrum allocated to *primary service* through spectrum sharing mechanisms. Cognitive radio technology which enables secondary users to share spectrum with primary users in an opportunistic manner can be implemented for this. Scheduling or resource allocation is a major factor for efficient utilization of any shared resource. Opportunistic scheduling policies which utilize time varying multipath fading channel are best to implement in wireless networks. In this paper, performance analyses of resource allocation algorithms for secondary users are presented, specifically, rate-based, delay-based and utility function based scheduling algorithms. Performance analyses of scheduling algorithms are made by theoretical and simulation analysis of fundamental mechanisms in wireless resource management, like throughput fairness, delay fairness. Effect of different channel fading conditions on scheduler performance is presented in detail, in particular, Rayleigh fading and Nakagami fading channels are considered. The simulations are done using the software MATLAB.

Keywords: Cognitive radio, Dynamic spectrum sharing, Radio resource allocation, Scheduling, Spectrum underutilization.

1. Introduction

Many distinct radio access technologies operate in various frequency bands; these technologies are implemented to provide services that are both common and disparate. A static or fixed spectrum allocation policy is implemented now, in which frequency bands are statically assigned to different wireless services. The results of survey done by Ofcom shows, there will be a significant increase in demand for these services over the next 10-15 years. At the same time use of voice calls which is the conventional application for the cellular services is reducing significantly. This change is due to rapid growth of data centric applications like use of 3G data cards, video streaming, online gaming and download applications. There are other data centric applications which are to be introduced in coming years and expected to increase the traffic much more in coming years [1].

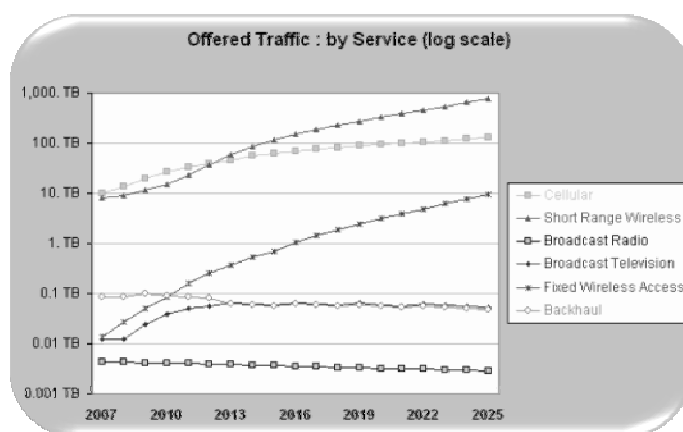


Figure 1: Total offered traffic (Terabytes) by service (log scale) over the coming years [1].

Figure 1 shows the expected network traffic of different wireless services over the next 10-15 years.

