

WhiteMesh: Leveraging White Spaces in Multihop Wireless Topologies

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Abstract—

I. INTRODUCTION

FCC is working on adopting rules to allow unlicensed radio transmitters to operate in the white space freed from TV band since 2010 [1]. White space is popularly referred to unused portions of the UHF and VHF spectrum includes, but not limited to FIXME. These bands provides superior propagation and building penetration compared to licensed wifi bands like the 2.4 and 5GHz bands, holding rich poentnial for expanding broadband capacity and improving access for wireless users. Point to point users may entend their connecting range in white space and avoiding excessive competing in their licened bands. Users in a networks can enjoy multiple benefits through multihop links combining white space and licensed bands. However, access to these advantages of white space bands also comes with both technical and commerical challenges. A direct request from the users would be the rules to assign the channels in different band according to their characteristics. More benefits could be obtained by multihop networks users. However, in a multihop networks, the problem becomes complex with tons of options come from multiple bands and multiple relay nodes combination as a NP-Hard problem.

To have a piece of partial optimization of this NP-Hard problem, some research has been working on different requirements. Researchers works for on-demand optimization. and some multi-channel works also answer part of the channel assignment problem. Most of these works bring fairness as a parameter for the evaluation [2]. As a member of a networks, one should balance other users' demand when approach the selfish best performance. For networks manage, to be fair for all the users, a way could be assign time equally to all the users in the networks.

This paper is focusing on approaching multiband-multihop channel assignment and link selection optimization subject to time fairness.

The main contributions of our work are as follows:

- We first develop a framework for multiband channel assignment using both historical information and instantaneous measurements. This framework is broad enough to study adaptation across licensed, and unlicensed band including white space frequency bands.
- We propose a methodology to leverage the infulence of white space in wireless communication subject to time fairness.
- We perform extensive outdoor experiments from multiple environments and simulations to evaluate the proposed algorithms.

II. RELATED WORK

Since FCC ruling obviated mandatory spectrum sensing in whtie spaces networks, prior research in UHF white spaces has focused on accurate detecting the primary user [3]; assigning white spaces channels [4]. In [5], database is applied to detect white space channel. Employing the energy advantage of UHF bands is proposed to improve the performance for indoor networks [6].

In [7], a placement algorithm for wireless mesh networks is proposed for white space bands.

However, these works only focus on white space bands fails to connect the ISM bands and tons fo existing wireless devices for pratical application.

Tons of works have been done for multichannel multiradio. Cognitive Radios

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