

Preface

With the rapid development of broadband wireless communication techniques and increasing popularity of bandwidth-hungry multimedia applications, the industry faces significant challenge to meet the rapid expansion of wireless service requirements and users' Quality of Experience (QoE) due to the spectrum resource scarcity. On the other hand, there are widely witnessed low efficiency of static resource management mode, unbalanced spectrum resource distribution problem in real-world wireless networks, and additionally the distinguished resource acquisition abilities for distinguished wireless users. To address the related issues, dynamic spectrum sharing technologies have been leveraged as an effective approach to improve the wireless resource utilization and users' QoE for future broadband wireless networks, which is the focus of this book.

The book starts with an overview of the current state-of-the-art research literature about the efficient wireless resource utilization by leveraging the dynamic spectrum sharing technology. By utilizing spectrum access opportunities located in cellular frequency bands, a novel cognitive radio enabled dynamic overlay spectrum sharing framework with external sensors, i.e., external sensing agents, is developed. The opportunistic cellular frequency-band sharing is formulated as a dynamic resource demand–supply matching problem, and accordingly a fast distributed spectrum sharing algorithm is developed to solve the resource matching problem. Furthermore, WhiteFi Infostation is engineered, which is dedicated for Internet-based vehicular media streaming by leveraging Geolocation database enabled TV White Spaces (TVWS) spectrum sharing. After demonstrating the empirical observations of unique TV White Spaces spectrum features and analyzing the real-world TVWS data collected from Geolocation database, an optimal TVWS network planning is proposed for deploying WhiteFi Infostation with the objective of maximal network-wide throughput of TVWS sharing networks. The proposed TVWS network planning jointly considers the multi-radio configuration and the channel power tradeoff, which can be realized by decentralized Markov approximation. In addition, a location-aware contention-free multi-polling TV White Spaces access scheduling scheme is introduced for vehicular media streaming, which takes into account both the realistic vehicular application requirements and

the dynamics of wireless channel conditions. Furthermore, the book investigates how to support the wireless multimedia networking applications while satisfying Quality of Services (QoS) guarantees by leveraging the dynamic TV White Spaces spectrum access technique. Accordingly, services with distinct secondary spectrum requirements are characterized and the resource bidding behaviors of secondary users are formulated based on their corresponding service classes, which can shed light on the design of practical bidding strategy for database-assisted TV White Spaces spectrum trading market. In addition, a double-phase dynamic spectrum allocation scheme is developed to support prioritized services such as real-time multimedia applications. In this way, better service can be provided to the secondary users with higher priority while achieving significant improvement of revenue. Finally, this book is closed with some open issues for further researches in next generation wireless access networks with the aim of efficient spectrum utilization.

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