Dynamic spectrum access (DSA) is a promising solution for a world where innovative wireless technologies are stifled by a shortage of available spectrum caused by spectrum lock-in to legacy systems. Given a well-designed dynamic access scheme, cognitive radio devices can obtain spectrum that matches their demands and avoids interference to legacy devices by using separation in physical distance, time, or frequency. In this respect, the IEEE DySPAN conference has become the premier conference for presenting and discussing exciting research findings on dynamic spectrum access and cognitive radios. The 2011 conference received a record number of submissions in both technical and policy tracks. The final program includes works that make significant advances on a number of core areas, ranging from measurement studies, protocol and system designs, to analytical understanding of various DSA systems.

This special issue includes three highest ranked papers selected by the TPC chairs and members from the technical track of the 2011 DySPAN conference. Together, they offer a detailed look at practical deployment of dynamic spectrum access, from a measurement-based study on the availability of spectrum for dynamic access, to building an infrastructure network to support reliable dynamic spectrum access, and finally an analytical examination on the implication of dynamic spectrum access on user performance. These papers are extended versions of their DySPAN versions, and each went through a full review cycle, addressing all the review comments from the conference.

The first paper, “TV White Space in Europe” by Jaap van de Beek et al., examines the availability of TV white spaces in a number of European countries, and compares it to an earlier study on white space availability in the US. The authors focus on examining the impact of using RF propagation models in estimating spectrum availability. They show that while the choice of propagation models has little impact on the average spectrum availability, it does have a noticeable effect on the higher-level spectrum statistics. Overall, the paper confirms that Europe also has plenty of white spaces available, although it is slightly less than that in the US.

A key challenge of dynamic spectrum access is to determine when to safely transmit without disrupting legacy users. The current approach, driven by the FCC rulings, is to use spectrum databases to list local white space availability, thus removing the need for spectrum sensing. The second paper, “SenseLess: A Database-Driven White Space Network” by Murty et al., describes one of the first DSA systems leveraging spectrum databases. The authors developed an infrastructure service to identify usable local spectrum and manage spectrum access. While the concept seems simple, the authors identified several key practical challenges, developed a comprehensive solution using sophisticated propagation models, and verified their design using real world measurements.

In the third paper, “On the Origins of Heavy Tailed Delay in Dynamic Spectrum Access Networks,” Pu Wang and Ian F. Akyildiz examine the user-level performance of cognitive radio devices who must use spectrum with caution to avoid interfering legacy users. Specifically, they apply a rigorous analysis to derive transmission delay experienced by cognitive radio devices subject to different traffic patterns displayed by legacy users. The outcome of their study is interesting: The transmission delay is heavy-tailed if either the busy-time or the message size of the legacy user follows a heavy-tail distribution. While this is certainly unfavorable for many delay-sensitive applications, the authors also offered two methods to suppress the heavy tail in transmission delay.

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