

Preface

Global mobile traffic is expected to increase nearly tenfold by 2020 due to the increasing number of mobile-connected devices and the explosion of data-hungry mobile applications. Pushing traffic toward the network capacity quickly deteriorates the quality of service (QoS) perceived by users. Acquiring additional licensed spectrum to increase the capacity of Radio Access Networks (RANs) is increasingly expensive. Mobile operators are thus challenged by the revenue gap created by the exponential increase in mobile traffic not generating sufficient additional revenue to upgrade existing RANs. These circumstances have fostered an interest in cost-effective solutions to increase the capacity of RANs. Long-Term Evolution (LTE) in unlicensed bands (U-LTE) is among the promising solutions; however, since U-LTE is a nascent LTE technology, there are still various associated concerns and challenges needing to be addressed.

This brief first presents a comprehensive survey on U-LTE, focusing on technical issues and the impacts of this technology on neighboring networks in the shared frequency bands. Specifically, the concepts, motivations, benefits, obstacles, and coexistence requirements of U-LTE are presented. Three potential types of U-LTE—LTE-U, LAA-LTE, and MulteFire[™]—are explained. Next, current regulations for radio systems operating in unlicensed spectrum are reviewed. Due to the fact that technical knowledge of the medium access mechanisms employed by LTE and Wi-Fi is strongly required to understand and analyze the interactions between these two technologies when they operate in the same frequency band, high-level network architectures and technical details are presented. In particular, distinguishing features of CSMA/CA employed by Wi-Fi networks compared to standardized regulations are highlighted.

In order to capture the ongoing activities on U-LTE coexistence mechanisms, related works are surveyed with insight and observations on their limitations and concerns. This brief also presents our Network-aware Adaptive LBT mechanism (NALT) which is proposed for the LTE coexistence with Wi-Fi networks. In a nutshell, NALT monitors both channel conditions and usage activity to maximize its transmission opportunities, while maintaining fair sharing of the channel, in a way that is transparent to incumbent Wi-Fi devices. Finally, toward future working

directions, in light of the survey, this brief identifies a number of open technical questions as well as related potential research issues in U-LTE.

The findings in this brief provide telecom engineers, researchers, and academic professionals with valuable knowledge and potential working or research directions when designing and developing medium access protocols for next-generation wireless access networks.

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