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Radio Resource Management for Mobile Traffic Offloading in Heterogeneous Cellular Networks



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Preface

The past decade has witnessed an unprecedented growth of smart mobile devices and mobile Internet services, which leads to a tremendous increase of mobile traffic in cellular access networks. It becomes a critical challenge for the mobile network operators to efficiently accommodate such a heavy traffic demand. Conventional schemes such as directly upgrading network infrastructures and upgrading access technologies are undesirable due to the need of huge capital investments. By exploiting the multi-tier architecture of cellular networks, on the other hand, it becomes possible to actively offload mobile users' traffic from macrocells to heterogeneous small cells, and hence accommodate the heavy traffic in a cost effective fashion. However, achieving the promising benefits of traffic offloading requires proper radio resource allocations, and thus in this brief, we aim at providing concise discussions regarding radio resource management schemes for traffic offloading in heterogeneous cellular networks.

In Chap. 1, we start by providing an overview of the heterogeneous cellular networks and traffic offloading. Then, we illustrate different traffic offloading paradigms in heterogeneous cellular networks. To illustrate the designs of optimal radio resource allocations for traffic offloading in heterogeneous cellular networks, we provide two concrete design examples and present the corresponding promising benefits in Chaps. 2 and 3. Specifically, in Chap. 2, we study the paradigm of mobile users' uplink traffic offloading through small cells, and investigate the joint traffic scheduling and power allocation problem. The problem aims at minimizing mobile users' overall mobile data cost by properly offloading to small cells while avoiding severe co-channel interference. In Chap. 3, we study the paradigm of downlink traffic offloading via mobile users' device-to-device (D2D) cooperations for content distribution, and investigate the joint D2D-assisted users' cooperations and content transmission control problem with the objective of minimizing the overall radio resource usage. Finally, in Chap. 4, we draw conclusions and discuss about future research directions.

This brief illustrates the designs of optimal radio resource allocations for traffic offloading in heterogeneous cellular networks and exhibits the corresponding promising benefits. This brief can be used as a textbook or reference book for

postgraduate students working on advanced topics in wireless communications and networking.

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