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Rose Qingyang Hu • Yi Qian

Resource Management for Heterogeneous Networks in LTE Systems

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Rose Qingyang Hu
Department of Electrical
and Computer Engineering
Utah State University
Logan, UT, USA

Yi Qian
Department of Computer
and Electronics Engineering
University of Nebraska-Lincoln
Omaha, NE, USA

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To our respective families.

Preface

As a key technology in 4G-LTE, heterogeneous networks effectively extend the coverage and capacity of wireless networks by deploying multiple low power small base stations on top of the conventional macro base stations. The deployed small nodes differ in transmission power and processing capabilities, leading to new challenges in mobile association, interference management, and radio resource management. In this book, we consider downlink communications in a heterogeneous cellular network with high transmit power macro evolved Node Bs and low transmit power small evolved Node Bs.We provide an in-depth look on the key issues that could affect the performance of heterogeneous networks and present schemes that can effectively tackle these issues. In particular, we discuss the issue of unbalanced traffic load among the macro evolved Node Bs and small evolved Node Bs caused by the transmit power disparity and present a load-balancing based mobile association scheme to balance the traffic load among the macro evolved Node Bs and small evolved Node Bs. We explore the issue of high intra-cell interference received by the user equipment associated with the small evolved Node Bs from the high power macro evolved Node Bs and introduce a fractional frequency reuse scheme with proper power control to help reduce interference at user equipment that are the most vulnerable to such intra-cell interference. We investigate radio resource allocation issues for heterogeneous networks with intracell cooperation and propose a resource allocation framework that could achieve the maximum capacity with proportional fairness among user equipment. For each of the investigated issues and presented solutions, we also present numerical results to demonstrate the effectiveness of the proposed solutions in tackling the problems and improving network performance.

Logan, USA
Omaha, USA

Rose Qingyang Hu
Yi Qian

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