

Terminal-based Energy-Efficient Resource Allocation in OFDMA-Based Wireless Multicast Systems

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Abstract—At present, the user experience provided by smart mobile terminals is limited to the battery capacity. This paper focuses on how to improve the energy efficiency of terminals in OFDMA-based wireless multicast systems with frequency-selective channels. We assume that multicast terminals can switch to sleep mode during the transmission of some OFDM symbols according to their OFDMA frame-level quality of service (QoS) requirements. Based on it, we combine resource allocation with terminal sleeping mechanism, and propose a new resource allocation problem model. The task is to minimize the total time when terminals are in receive mode through jointly optimizing the subcarrier allocation for different multicast terminals and the power allocation between different subcarriers, which is a NP-hard problem. To adapt to the needs of real-time applications, we separate subcarrier and power allocation, and propose a low-complexity suboptimal algorithm for this problem. Performance evaluations are conducted in homogenous and heterogeneous networks respectively. Simulation results show that compared with traditional multicast and unicast, our proposed method reduce the total energy consumption of terminals significantly with the same QoS requirements of terminals guaranteed. Additionally, the advantage of our proposed method over traditional multicast diminishes with the increase of the maximum transmission power, and increase with the number of multicast terminals and OFDM symbols in an OFDMA frame.

Keyword—Energy Consumption, Terminal, Resource Allocation, OFDMA, Multicast



Jun Liu received the B. E. and M. S. degrees in communication engineering from Harbin Institute of Technology, China, in 2008 and 2010, respectively, and the Ph.D. degree in information and communication engineering from Tsinghua University, China, in 2014. From 2014 to 2015, he worked as an engineer at State Grid Information & Telecommunication Branch, Beijing, China. Now he is working as a Postdoctoral researcher at China Academy of Railway Science, Beijing, China. His current research interests mainly include wireless multimedia transmission, energy-efficient scheduling and resource allocation, and big data. He has published more than 10 peer-reviewed journal and conference papers.