Price-Based Resource Allocation for Self-Backhauled Small Cell Networks

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PII: S0140-3664(16)30202-X
DOI: 10.1016/j.comcom.2016.05.008
Reference: COMCOM 5329

To appear in: *Computer Communications*

Received date: 12 November 2015
Revised date: 29 March 2016
Accepted date: 15 May 2016

Please cite this article as: Ali Rahmati, Vahid Shah-Mansouri, Majid Safari, Price-Based Resource Allocation for Self-Backhauled Small Cell Networks, *Computer Communications* (2016), doi: 10.1016/j.comcom.2016.05.008

Price-Based Resource Allocation for Self-Backhauled Small Cell Networks

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Abstract

Heterogeneous cellular networks are promising solutions to address the need for the exponentially increasing data traffic demands by ensuring an acceptable level of quality of service. In such networks, base stations with different cell sizes serve the cellular areas (i.e., macro cells along with small cells). The access technologies of such base stations can be different as well. Small cell access points (SAP) are typically connected either directly to the core network through a wired link or to a macro-cell base station through a wireless backhaul link. In this paper, we consider the scenario where the SAP is connected to a macro-cell base station through a wireless backhaul link operating at the same frequency band as the access links from the SAP to its users. We consider amplify and forward (AF) protocol under both full/half duplex transmission modes for the SAP. Under such circumstances, we study the price-based resource allocation where the SAP charges each user equipment (UE) proportional to the amount of the power it allocates for transmission to that UE. A Stackelberg game is employed to model and investigate the joint utility maximization problem of the SAP and UEs. In our game model, the SAP is the leader and the UEs are the followers. We formulate the utility maximization problems for both the leader

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Part of this paper was presented at the *IEEE Conference on Communications* (*ICC'15*), London, UK, Jun. 2015.