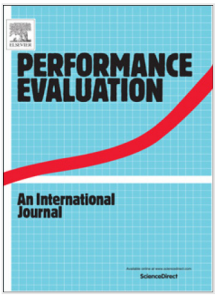
Accepted Manuscript



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PII: S0166-5316(17)30099-8
DOI: http://dx.doi.org/10.1016/j.peva.2017.03.002
Reference: PEVA 1897

To appear in: *Performance Evaluation*

Received date: 8 May 2016
Revised date: 5 December 2016
Accepted date: 8 March 2017

Please cite this article as: J. Wu, E.W.M. Wong, J. Guo, M. Zukerman, Performance analysis of green cellular networks with selective base-station sleeping, *Performance Evaluation* (2017), http://dx.doi.org/10.1016/j.peva.2017.03.002

Performance Analysis of Green Cellular Networks with Selective Base-Station Sleeping

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Abstract

Base station (BS) sleeping is one of the emerging solutions for energy saving in cellular networks. It saves energy by selectively switching under-utilized BSs to a low power consuming mode ("sleep mode") during low traffic hours while transferring their associated traffic to active BSs nearby. However, while saving energy, BS sleeping causes a reduction in total available capacity of the network, so Grade of Service (GoS) might be degraded, resulting in a trade-off between energy saving and network performance. This paper proposes a robust and computationally efficient analytical approximation technique, which we call Information Exchange Surrogate Approximation for Cellular Networks (IESA-CN), based on the recently established IESA framework for evaluation of GoS, as measured by call blocking probability, in cellular networks with different BS sleeping patterns. By considering the mutual overflow effect between BSs, the newly proposed method is verified by extensive and statistically reliable simulation experiments to significantly improve the accuracy as compared to traditional Fixed-Point Approximation in a wide range of scenarios.

Keywords: Blocking probability, approximation, base station, cellular network, energy efficiency.