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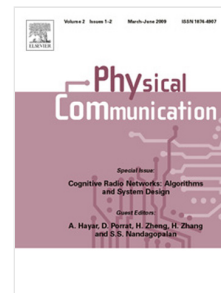
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# Performance Evaluation of Backhaul Bandwidth Aggregation Using a Partial Sharing Scheme

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## Abstract

To cope with the increasing demand of mobile devices and the limited capacity of cellular networks mobile connections are offloaded to WiFi. The access capacity is further increased, by aggregating bandwidth of WiFi access links. To analyse the performance of aggregated access links we model the most simple case of two cooperating systems interchanging capacities using an offloading scheme. The resulting analytic model is computed by means of a two-dimensional birth and death process. It can be used to seamlessly evaluate the performance of systems between partitioning and complete sharing. This allows to optimize the setting of thresholds dependent on the load of the cooperating system. Furthermore the benefit of aggregating bandwidth in different scenarios with homogeneous and heterogeneous workloads is quantified.

*Keywords:* Markov Model, Complete Sharing, Partitioning, Partial Sharing, Bandwidth Aggregation, WiFi

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## 1. Introduction

According to [1], in 2014, mobile networks carried nearly 30 exabytes of traffic, which is expected to increase nearly 10-fold towards 2019. To handle the growth and reduce the load on the mobile networks, offloading to WiFi has come to the center of industry thinking [2]. In 2014, 46% of total mobile data traffic was offloaded onto the fixed network through WiFi or femtocell, and it is forecast that, by 2016, there will be more traffic offloaded than remaining on cellular networks.

In contrast to strict offloading, in which the Internet access link is switched completely (e.g., from cellular to WiFi), current concepts (e.g., BeWifi<sup>2</sup>) also

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<sup>2</sup><http://www.bewifi.es/>

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