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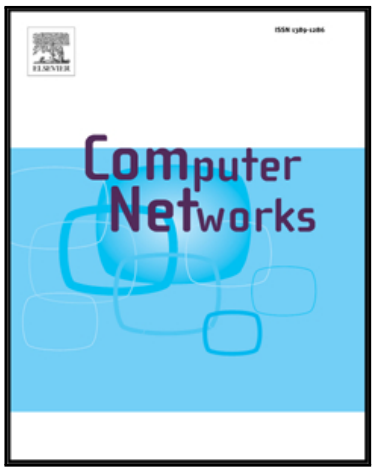

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Abstract

Mobile data traffic inside mobile operator's infrastructure is increasing exponentially every year. This increasing demand forces mobile network operators (MNOs) to seek for alternative communication methods in order to relieve the traffic load in base stations, especially in highly populated and crowded environments. Network assisted data offload and Device-to-Device (D2D) communications are two prominent methods to help MNOs solve this problem. In this study, a data offload framework is developed that incorporates network assisted multiple attribute decision making (MADM) for best network selection and D2D communications for exploiting user proximity in crowded environments. The performance of the framework is evaluated with simulation results as well as analytic solutions and performance bounds. The simulation results indicate the superiority of incorporating network-based information besides user-based information in offloading decisions and demonstrates the significant benefits of D2D communications when the density of D2D users is properly adjusted. The simulation results depict that up to 168% and 200% increase in user satisfaction and throughput can be achieved under high network load scenarios at optimal D2D density.

Keywords: data offloading, device-to-device, proximity services, heterogeneous networks, LTE, 5G, multiple attribute decision making.

1. Introduction

The diversity and dimensions of wireless networks have increased substantially during the last decade. This causes massive connectivity management issues that need be optimized by Mobile Network Operators (MNOs). The increase in alternative heterogeneous networks has pushed MNOs to seek methods that can exploit various networks for offloading purposes. In addition to the expansion in infrastructure based wireless networks such as Long Term Evolution (LTE) and Wi-Fi, D2D communications are also arising as an alternative or complementary approach for

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