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Article

# Analytical and Experimental Evaluation of a Novel Mechanism to Improve the Control Plane in Next-Generation Mobile Networks

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**Abstract:** With the continuous development of mobile communications and the Internet of Things technology, the enhanced network performance can be seen as one of the major challenges in the fourth industrial revolution context, where new services and applications with strict performance requirements have emerged, such as driverless vehicles, smart cities, factories, and manufacturing, among others. These new services and applications also drive growth of the data traffic, which is increasing exponentially. Thus, in mobile network environments, industry and academia are proposing new mechanisms to overcome the traffic bottlenecks and reduce the signaling overhead that affects current networks. Centralized Mobility Management solutions are prone to several problems such as the aforementioned signaling overhead or scalability issues. To overcome these limitations, Distributed Mobility Management approaches are being considered. In this paper, an analytical cost model and experimental evaluation will be developed for evaluating the performance of the Distributed Mobility Management implementations. Furthermore, a new approach will be proposed to improve network performance.

**Keywords:** networked control; control plane; distributed mobility management; experimental evaluation

## 1. Introduction

Over the last years, the Internet has transformed the telecommunications industry and will continue to do so because the number of devices are increasing. Furthermore, mobile data traffic has experimented an exponential growth due to the proliferation of these smart mobile devices and the emergence of Internet of Things (IoT). All these changes are impacting on communications networks environments. According to a recent forecast, there will be 28.5 billion networked devices by 2022, 37% greater compared with 2017. In addition, global mobile data traffic will increase sevenfold between 2017 and 2022, reaching 77.5 exabytes per month by 2022 [1]. The signaling overhead is expected to increase almost 50% faster than the growth in data traffic [2].

With the emergence of interconnected devices and services, the IoT has been touted to become the next major extension to the current fixed and mobile networking infrastructures. In this heterogeneous environment, the challenge is the provisioning of adequate mobility management to control and exploit realistic mobility of both IoT devices and real-world entities.

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