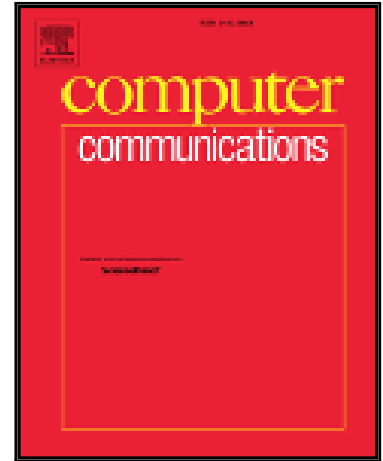


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# Making opportunistic networks in IoT environments CCN-ready: a performance evaluation of the MobCCN protocol

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## Abstract

In future IoT environments it is expected that the role of personal devices of mobile users in the physical area where IoT devices are deployed will become more and more important. In particular, due to the push towards decentralisation of services towards the edge, it is likely that a significant share of data generated by IoT devices will be needed by other (mobile) nodes nearby, while global Internet access will be limited only to a small fraction of data. In this context, opportunistic networking schemes can be adopted to build efficient content-centric protocols, through which data generated by IoT devices (or by mobile nodes themselves) can be accessed by the other nodes nearby. In this paper, we propose MobCCN, which is an ICN-compliant protocol for this heterogeneous environment. MobCCN is designed to implement the routing and forwarding mechanisms of the main ICN realisations, such as CCN. The original aspect of MobCCN is to implement an efficient opportunistic networking routing scheme to populate the Forwarding Interest Base (FIB) tables of the nodes, in order to guide the propagation of Interest packets towards nodes that store the required data. Specifically, MobCCN defines the *utility* of each node as a forwarder of Interest packets for a certain type of content, such that Interest packets can be propagated along a positive utility gradient, until reaching some node storing the data. We evaluate MobCCN against protocols representing two possible endpoints of the spectrum, respectively in terms of minimising the data delivery delay and the resource consumption. Performance results show that MobCCN is very effective and efficient, as it guarantees very high delivery rates and low delays, while keeping the total generated traffic at a reasonable level and also saving local resources.

*Keywords:* Information-centric Networks, CCN, Opportunistic Networks, IoT

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## 1. Introduction

Internet of Things (IoT) and opportunistic networks have not often being correlated with each other and considered as part of a unique networking environment. However, we believe that they are significantly complementary, and using opportunistic networks in IoT environment can result in very efficient and dynamic IoT systems deployments.

In this paper we consider such a mixed network environment. Concerning IoT, we assume that a large number of fixed IoT devices are spread in a given physical area. As far as the opportunistic network, we consider that a number of mobile users equipped with personal devices (e.g., smartphones or tablets) move in the same physical area. Both types of devices can generate and consume data. IoT devices can be sensors and/or actuators, which thus generate data about the physical environment and request data to decide how to act upon it. Users devices request data based on the applications running on them, but can also act as mobile sensors, thus collecting data that are required by the other nodes in the network.

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