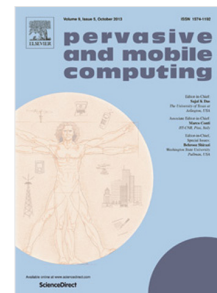


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Data Collection and Upload under Dynamicity in Smart Community Internet-of-Things Deployments

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Abstract

The Internet of Things has enabled new services to communities in many domains, e.g. smart healthcare, environmental awareness, and public safety. These services require timely and accurate event delivery, but such in-situ deployments are often limited by the coverage of sensing/communication infrastructures. In this paper we develop effective, scalable, and realistic data collection and upload solutions using mobile data collectors in community IoT systems. Specifically, we address the optimized upload planning problem, i.e. determine the optimal schedule for communication to enable timely data delivery under dynamicity in network connectivity, data characteristics/heterogeneity, and mobility. We develop a two-phase approach and associated policies, where an initial upload plan is generated offline with prior knowledge of networks and data, and a subsequent runtime adaptation alters the plan under multiple dynamics. To validate our approach, we designed and built SCALECycle, our mobile data collection platform, and deployed it in real communities in Rockville, MD and Irvine, CA. Measurements from these testbeds are used to drive extensive simulations. Experimental results indicate that compared with opportunistic operation, our two-phase approach using a judicious combination of policies can result in 30–60% improvement in overall data utility, 30% reduction in collection delays, along with greater resilience to dynamicity and improved scalability.

Keywords: community, Internet of Things, data collection, upload planning, mobility

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