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Device-centric sensing: An alternative to data-centric approaches

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Abstract

© 2007-2012 IEEE. When pieces of information originate from the physical world through the sensing infrastructure, there is a pressing need to cope with the overhead and inherent limitations lying in merely shifting huge amounts of aggregated data across the net. In this scenario, a key point is the minimization of wasted bandwidth to accommodate for ever-growing demands of sensing data. For effective treatment of sensing data, BigData principles and approaches should be adopted, particularly the one by which computing has to be brought as near as possible to data. In this paper, we propose a new approach to deal with sensing data inspired by this principle, injecting intelligence on the device instead of just using it as source of data, thus reversing the trend from the current data-centric paradigm toward a device-centric one. This way, we shift the focus from the application level onto the infrastructure one, adopting a Cloud-oriented approach to abstract and virtualize sensor-hosting boards ready to be reconfigured with custom logic, such as MapReduce, by providing resources on demand, as a service. Theoretical, design, and technical aspects have been addressed in this paper through the evaluation of a device-centric sensing infrastructure-as-a-service (IaaS) stack implementation. In particular, a prototype for mobiles is described, getting into platform-dependent details where needed. The facilities so far implemented under the Android platform have been put under preliminary testing through a mobile application.

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Keywords

BigData, Cloud, infrastructure as a service (IaaS), mobiles, sensing abstraction and virtualization, sensors and actuators

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