Distributed Data Fusion for the Internet of Things

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Abstract. The ubiquitous Internet of Things is underpinned by the recent advancements in the wireless networking technology, which enabled connecting previously scattered devices into the global network. IoT engineers, however, are required to handle current limitations and find the right balance between data transferring range, throughput, and power consumption of wireless IoT devices. As a result, existing IoT systems, based on collecting data from a distributed network of edge devices, are limited by the amount of data they are able to transfer over the network. This means that some sort of data fusion mechanism has to be introduced, which would be responsible for filtering raw data before sending them further to a next node through the network. As a potential way of implementing such a mechanism, this paper proposes utilising Complex Event Processing and introduces a hierarchical distributed architecture for enabling data fusion at various levels.

Keywords: Data fusion · Complex Event Processing · Distributed architecture · Internet of Things · Edge computing · Cloud computing

1 Introduction

The development of the Internet of Things (IoT) and ubiquitous penetration of 'smart' devices in almost every aspect of people's everyday life have been supported by the rapid progress in the networking area and – more specifically – wireless technologies. Wireless communication enabled connecting previously disconnected embedded devices into the global network, facilitating device discovery, querying and interaction. Examples of such wireless networking technologies, actively used in the context of complex distributed IoT systems, include LPWAN, Bluetooth Low Energy, ZigBee, Wi-Fi, etc. These technologies differ in their data transferring range, throughput, and power consumption. These three aspects are typically seen as the key factors when choosing a particular wireless technology to a be applied to a scenario at hand. There also exists a dependency between these three factors. Usually, the larger the data transferring range, the lower the throughput, and vice versa. Increasing any of the two – either the range or the throughput – typically leads to an increased power consumption.

V. Malyshkin (Ed.): PaCT 2017, LNCS 10421, pp. 427–432, 2017.
DOI: 10.1007/978-3-319-62932-2_41