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Contributions Related to the Design of Iot-Enabled CPS

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Editorial

Big Data, Internet of Things, and Cyber-Physical Systems are three ideas that are closely related in the next generations of cooperative solutions, where humans, autonomous devices, and the environment collaborate to achieve specified objectives. The CPS is created by combining embedded computing systems, intelligent objects, people, and physical settings, which are often connected via a communication infrastructure. Smart grids, smart factories, smart homes, smart factories, and smart transportation systems are a few examples of these systems. The Internet of Things (IoT) concept describes a global network of linked, heterogeneous items that may communicate with one another via established protocols. Numerous artefacts, such as sensors, actuators, RFID tags, embedded computers, and mobile devices, are among these objects. IoT can be understood as a paradigm that facilitates the construction of loosely-coupled, decentralised systems through the cooperation of smart objects, going beyond such a networking-oriented description. Within the integrated cyber-physical infrastructure, these items may act as intelligent agents with a degree of autonomy, collaborate with other agents as needed, and communicate information with users and other computing devices [1-3].

The large-scale nature of IoT-enabled CPS raises several big data challenges, ranging from system-level management and control to data analytics. The system-level challenges are typically related to methods for controlling global systems, making more effective the implementation and evolution of large-scale management platforms, or defining appropriate control interfaces for IoT technologies. The wide spread of IoT-based solutions are driving more and more data into enterprises, resulting in the necessity of big data analytics as a tool for gathering important data. For data processing systems, this represents a potential to enhance data gathering, cleansing, and storage as well as real-time analytics, but it also poses a number of obstacles. The articles that are a part of this special issue and contribute new knowledge to its design, implementation, and application of IoT-enabled CPS are briefly introduced in the following sections. The performance and behaviour of the IoT-enabled CPS are directly impacted by the network's quality attributes since they are tightly tied to the communication infrastructure that facilitates interactions between the participating devices. In several scenarios (like monitoring of physical infrastructure or control of production activities) these systems use a large-scale and dynamic network infrastructure to support the communication and coordination among their components. In search of ways for extending the lifetime of low-power wireless networks that support CPS solutions, many researchers devise algorithms to optimize the transmission power. Yet, although manufacturers develop nodes with various levels of transmission power, insights on how to best use those levels are missing. The issue is not only the dependence of existing methods on unstable link quality metrics.

The paper entitled "Impact of Transmission Power Control in Multi-hop Networks", argues that the biggest barrier is the isolation of Layers 2 and 3 from Layer. It is one of a handful studies that sheds light on how MAC and routing protocols react to changes in transmission power. The authors argue about the need to find a stable power level, minimizing frequent changes, which have detrimental effects on energy efficiency and routing-level stability. The paper "A Distributed Event-Based System based on Compressed Fragmented Iterated Bloom Filters" proposes a method for the construction of a novel architecture of Fragmented-Iterated Bloom Filters, which can be deployed at broker nodes of a distributed event-based system in order to route events in a network of constrained sensing devices. This paper addresses the management of events in distributed networks that support event-based CPS. The method is contrasted with traditional Bloom filters, and the results demonstrate that the idea tends to be more effective in terms of memory usage and computation, as well as lowering the likelihood of false positives. It is well-known that the implementation of IoT-enabled CPS is an important challenge for software engineers, due the number of functional and non-functional requirements usually involved in the development of these systems. In this sense the article entitled "COMFIT: A Development Environment for the Internet of Things", contributes to address this challenge by providing an integrated development environment grounded on the paradigms of model-driven development and cloud computing. This tool supports code generation, simulations and code compilation of IoT-enabled applications. COMFIT is composed of two major modules [4,5].

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