Sensor-Actuator Software Component Stack for Industrial Internet of Things Applications

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Abstract

Recent developments in software, hardware, and communication technologies resulted in a sudden increase of things connected to the Internet. Not only did the number of devices connected to the Internet increase exponentially, so did their kind - devices previously unthought-of are now participants of the Internet of Things/Everything ecosystem. Subsequently, the reusability of existing IoT solutions or solution components is crucial to face the high demand for new types of things to be connected to the network. A well-defined, architectural approach that implements reusability is crucial. In this paper, IoT Systems are viewed as a whole and abstracted to an immense spread-out device that is sensing everything and acting to everything in the environment. Consequently, a concept which views the Internet of Things as an Internet of Sensor-Actuator is proposed. This concept assumes that interaction with the environment is provided by well-defined Sensor-Actuator pattern components that provide services to the applications. By combining practices from the automotive layered architecture approaches, as well as the Sensor-Actuator Pattern defined for the system scaling and reuse purposes, the similarity of the signal conditioning for acquiring and acting is pointed out. Furthermore, the diagnosis and protection procedures are discussed for both sensors and actuators, and their auxiliary functions are considered. The proposed architecture is analyzed on an industrial robotic arm application.

Keywords: industrial Internet of Things, industry 4.0, layered architecture, signal conditioning, sensors, actuators,

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