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Alina M. Chircu
Bentley University, achircu@bentley.edu

Eldar Sultanow
Capgemini, eldar.sultanow@capgemini.com

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Alina M. Chircu, Bentley University, USA, achircu@bentley.edu
Eldar Sultanow, Capgemini, Germany, eldar.sultanow@capgemini.com

Extended Abstract

The Internet of Things (IoT) comprises many emerging technologies that enable wireless interconnections among "things" (usually objects such as personal devices, appliances, cars, or industrial equipment, but also living things such as animals and people) equipped with data-gathering sensors. Early predictions indicate that the number of IoT devices could reach 26 billion worldwide by 2020 (Lee and Lee, 2015), but this estimate is likely to increase as more companies are jumping on the IoT bandwagon. One of the greatest predicted impacts of IoT is in industrial settings – where it will help transform entire industries by creating new opportunities for companies to manage their internal processes and interact with customers (Iansiti and Lakhani, 2014). These industrial IoT technologies and applications are denoted by the term Industry 4.0. Accenture predicts that collecting data from sensors placed on products, equipment, and even users, and using this data to improve processes inside and outside organizations "can add trillions of dollars to the global economy by 2030." (Purdy and Davarzan, 2015).

As IoT technologies proliferate, it will become increasingly important for companies to understand the existing opportunities for Industry 4.0 and effectively adopt and deploy the technologies both internally and in inter-organizational relationships. Architectures are models that can help guide companies in their Industrial IoT journey. For example, understanding the layered architecture of digital technologies can help companies innovate by developing appropriate digital product platforms (Yoo et al., 2010). Companies can use architectural frameworks to make sense of strategic recommendations emerging from current research studies – such as the need to build adequate operational and digital services infrastructures to support a company's digital strategy (Ross et al., 2016). Architectures can be built at the company level, such as in the case of enterprise architectures (EA) that describe a company's "business and operating model, organizational structure, business processes, data, applications and technology" (Ahlemann et al., 2012), or at the industry level, such as in the case of reference architectures (RA) that present a high-level, organizing view for an industry, including its processes, stakeholders, organizational, informational and technology structure (Czarnecki and Dietze, 2017). EAs and especially RAs are essential for developing interconnected business platforms that enable companies and their customers, vendors and business partners to orchestrate the delivery of internal and external services in effective and efficient ways (Stettiner and Fienhold, 2012). At present, the work on Industrial IoT architectures is just starting, and few models exist. In this paper, we report on our experience working with academic and industry partners to select architectural frameworks and build reference architectures for several industries. We also discuss the challenges for the adoption and use of Industrial IoT reference architectures.

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