Chapter 28
Model-Driven Multi-Domain IoT

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ABSTRACT

The Internet of Things (IoT) is the network of physical objects embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. The chapter introduces the Model-driven Multi-Domain IoT concept and provides a method and a supporting framework. Multi-Domain IoT as the actual frontier for innovation, competition, and productivity. The method supports effective service and application development and therefore covers connected devices, data collection, data access and complex analytics. The efficiency of the method and the framework is confirmed by several projects. Selected parts of these projects are introduced as innovation projects and case studies.

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INTRODUCTION

The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, resulting in improved efficiency, accuracy and economic benefit.

Technology trends continue by the unstoppable path towards cloud computing, big data, applications, mobile devices, wearable gadgets, 3D printing, integrated ecosystems, and of course the IoT as the next computing platform. (Swan 2013; Thibodeau, 2014)

This chapter introduces the *Model-driven Multi-Domain IoT* concept and provides a method and a unified framework supporting Multi-Domain IoT services, application design and development. In a multi-domain IoT environment, data comes from several sources: sensors that collect traffic, health, climate and further information, posts on social networking sites, digital images and videos, records of purchase transactions or mobile phone GPS signals to name some of the most significant.

We see Multi-Domain IoT as the actual frontier for innovation, competition, and productivity. The introduced method supports effective service and application development and therefore covers the following areas: connected devices (connectivity, intelligence), data collection (sensors, storage), data access (cloud, standards, open APIs, security), complex analytics (big data tools), and unique value (realization of the true potential driven by the connected society).

The key points of the suggested method are:

Step 1.- IoT (Sensors, Devices, Connectivity and Services): IoT is about to increase the connectedness of people and things. IoT ecosystems can help consumers achieve goals by greatly improving their decision-making capabilities via the augmented intelligence based on the collected and analyzed data.

Step 2.- Multi-Domain IoT (SensorHUB): SensorHUB (SensorHUB) is both a method and a framework to support IoT-related application and service development. Furthermore, it effectively supports the discovery of data correlations that drives the product improvement, service development and the efficiency of the business activities.

Step 3.- Model-driven Multi-Domain IoT (VMTS + SensorHUB): The utilization of software modeling and model processing techniques is provided to enrich the service and application development for the IoT area and improve its efficiency. As a result, we can increase both the development productivity and the quality of software artifacts, furthermore we can significantly reduce the time-to-market.

Our team has developed both the SensorHUB and the Visual Modeling and Transformation System (VMTS) frameworks. SensorHUB focuses on the IoT-enabled service and application development, including the multi-domain support, while VMTS is our software modeling and model-processing environment. The *Model-driven Multi-Domain IoT* concept utilizes the capabilities of both, furthermore, it realizes model-driven, quality assured service and application development for the Multi-Domain IoT area.

The chapter discusses the SensorHUB framework (Section 2), its multi-domain capabilities (Section 3), introduces the VMTS framework and the synergy of VMTS and SensorHUB, i.e. our *Model-driven Multi-Domain IoT* concept (Section 4). The efficiency of the method is confirmed by several projects. Selected parts of these projects are also discussed in order to support understanding and serve utilization of the method. Finally, concluding remarks are elaborated.