Chapter 6
An Integrated LoRa-Based IoT Platform Serving Smart Farming and Agro-Logistics

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ABSTRACT

The value chain of agri-food is radically changed due the fact that consumers, as well as various players in the agro-logistics chain, seek for increased and trustful food safety. Given the specific characteristics of the agri-food supply chain, having numerous origin points, several aggregations hubs at different levels and then again numerous points of sales, the need of a holistic approach in collecting, forwarding and interpreting data in an interoperable way is a dire need. In this chapter, the authors present the architecture of the traceability platform KalaΘos™ and its IoT management module called, GP CoreIoT™. The KalaΘos infrastructure includes a network of sensors devices at farms, equipment, trucks, aggregation, processing, and logistics facilities, connected to a network of LoRa gateways. Its open architecture focuses on semantic and syntactic interoperability approaches for joint exploitation of data collected and managed by other systems with similar aims and scope.

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INTRODUCTION

There is a great potential for application of Internet-connected technologies in the food and agriculture sector, especially in view of the social and environmental challenges, which the aforementioned sector faces. From the farm to the shelf of a retail store, Internet of Things (IoT) technologies, as an element of the value chain of agri-food, could transform the sector by contributing to food security and to reduction of agricultural inputs and food waste. The data in this kind of supply chains typically initiates from the nurseries and farms, continues at packing, slaughtering and other processing facilities, thereupon reaches the wholesalers' premises and ultimately the retailers' facilities and the points of sale. Fusion of sensors, telecommunication networks, such as LoRAWAN™, and data handling platforms are included in IoT technologies and combined with traceability platforms and decision support systems, aim to provide end-to-end information and knowledge in order to address these specific needs.

The objectives of the chapter are to analyse the current status of agri-food value chain, with the main focus on its nature and on its specific challenges as well as to explore how the IoT technologies may constitute an active part of this value chain. Furthermore, a general overview of the IoT telecommunication networks, of sensors' devices and of data handling platforms is presented. There is also an in-depth discussion about issues related to the IoT approaches and solutions in agri-food value chain for both primary activities and logistics supporting activities.

Business models, such as freemium and sensors as a service, are also discussed, addressing the need of viable ecosystems to be established in which different business actors and stakeholders are actively involved in the collection of the data and the use of the information towards the creation of value.

An extensive description of KalaΘos™ platform and its IoT management module, as well as information about the real-world pilot application of these systems, are also included.

IOT TECHNOLOGIES

IoT and Telecommunication Networks

The Internet of Things (IoT) constitutes the communication network of a variety of devices, home appliances, cars, and any other object that incorporates electronic media, software, sensors, actuators and network connectivity, and allows data connection and exchange. Simply put, the philosophy of IoT is to connect all electronic devices to one another (local area network) and / or to the internet (world