IoF2020

Compilation of Use Case Requirements

WP 3

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Project Summary

The internet of things (IoT) has a revolutionary potential. A smart web of sensors, actuators, cameras, robots, drones and other connected devices allows for an unprecedented level of control and automated decision-making. The project Internet of Food & Farm 2020 (IoF2020) explores the potential of IoT-technologies for the European food and farming industry.

The goal is ambitious: to make precision farming a reality and to take a vital step towards a more sustainable food value chain. With the help of IoT technologies higher yields and better-quality produce are within reach. Pesticide and fertilizer use will drop and overall efficiency is optimized. IoT technologies also enable better traceability of food, leading to increased food safety.

Nineteen use-cases organised around five trials (arable, dairy, fruits, meat and vegetables) develop, test and demonstrate IoT technologies in an operational farm environment all over Europe, with the first results expected in the first quarter of 2018.

IoF2020 uses a lean multi-actor approach focusing on user acceptability, stakeholder engagement and the development of sustainable business models. IoF2020 aims to increase the economic viability and market share of developed technologies, while bringing end-users' and farmers' adoption of these technological solutions to the next stage. The aim of IoF2020 is to build a lasting innovation ecosystem that fosters the uptake of IoT technologies. Therefore, key stakeholders along the food value chain are involved in IoF2020, together with technology service providers, software companies and academic research institutions.

Led by the Wageningen University and Research (WUR), the 70+ member consortium includes partners from agriculture and ICT sectors, and uses open source technology provided by other initiatives (e.g. FI-WARE). IoF2020 is part of Horizon2020 Industrial Leadership and is supported by the European Commission with a budget of €30 million.

Public Executive Summary

Within IoF2020, WP3 aims at supporting the project's use cases in leveraging existing IoT technologies, approaches, and solutions, and facilitate collaboration between use cases. WP3 has been developing work to provide a horizontal perspective of the 19 use cases, divided into five trials. This work has the purpose of, on one hand, identifying reusable components, gathering validation results and lessons learnt from the use cases, and, on the other hand, recognizing additional support the use cases may require that can be fulfilled by reusable common IoT components, potentially provided by WP3.

This deliverable reports results from work performed in the scope of task *T3.3 Smart Agri-food Open Platforms*, focusing on determining IoT components that are most useful for the implementation of different use cases. This deliverable elicits user requirements for these components and provides their initial description.

Each of the 19 use cases in IoF2020 is developing and testing their own IoT-based solutions over several implementation cycles, where each cycle results in a so-called minimum viable product. As described in deliverable D3.2, the use cases include a number of individual assets reusable for similar or even different types of use cases. When bringing together the overall needs of the use cases and required technologies, the objective of the current deliverable is to identify reusable components that can facilitate the development of IoT based solutions. All use cases were described using a functional architectural view, identifying all major components in the different layers and categorising them as commercial, individual or reusable. This supported listing reusable assets, additional developments and products for each of the use cases.

Consolidating the needs of the use cases enabled an overview of the main challenges, and identification of needed components. The following components have been identified, described, and are being developed in the scope of WP3:

- IoT catalogue provides access to IoF2020 results not only to all use cases but to a wider audience. This enables a connection point between end users and solution providers, where developments and respective validations can be shared.

- Security and privacy guidelines describe the main concerns raised by the use cases, possible analysis approaches and how to improve security by implementing the right processes and selecting suitable technologies.

- Security enhancing enablers covers authentication and authorization management, which was one of the most common reusable components identified by the use cases and solutions for threat mitigation.

- Context Information management describes the FIWARE context broker and NGSI, to support exchange of data, supporting unidirectional collection of data from sensors and systems, and bidirectional exchange of data among components and systems.

- Service provision for replicability and reuse is a component that provides a solution for a business collaboration between an end-user and a service provider and developer.

- FMIS and reusable integration services describes the Connect API of 365FarmNet FMIS supporting creation, acquisition, exchange and visualization of data to this system.

- Open data marketplace and configurable dashboards describes a component that supports use cases in getting the most of all the data being collected with the new IoT solutions and devices.

IoF2020 developed an approach for structuring key functionalities for IoT based solutions development, i.e. an architectural functional view, which was mapped to the hierarchical layers of the IoT reference model. This was used to structure the functional components of the IoF2020 use cases and to facilitate the identification of reusable components as well as on how to facilitate the architectural design with respect to an improved interoperability. However, the focus is on solution development and validation for the agri-food domain. Nevertheless, in preparation of a medium to long-term strategy and the envisaged elaboration of guidelines for the use of IoT related standards in smart farming and food security, an initial mapping of RAMI4.0 to the functional view of the IoT architecture reference model was elaborated.

Using a reference architecture model that can bridge the communication gap between different domains is considered as a useful tool for being able to map solutions that are developed in a specific sector of the agri-food domain to other domains. This is also considered relevant when mapping solutions that are real-

ised in the agricultural domain (e.g. agricultural equipment usage) to solutions that are used in the industrialised domain of food processing and manufacturing. At the same time, it can facilitate the mapping of standards rather to a specific step in the production life cycle, value stream or process hierarchy level. Therefore, IoF2020 has started work towards a possible Reference Architecture Model for AgriFood 4.0, RAMAF 4.0.

The Reference Architecture Model for Industrie 4.0 (RAMI4.0) is a three-dimensional model combining perspectives for layers, life cycle & value stream, and hierarchical levels. This model was initially designed to support the industry or better to say manufacturing domain. However, the reference model presents a generic structure, which we believe can be the basis for other domains, namely food and farm.

The first mapping done was between the layers adopted in IoF2020 and the ones included in RAMI 4.0. The second mapping performed was between hierarchical levels, which clearly identify the functional assignments in te application domain.