

Leveraging Multi-domain Links via the Internet of Things

Towards Horizontal Integration of Vertical Pilots

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Abstract. This article describes the work on validation and measurement while dealing with integration of heterogeneous IoT systems being done within BUTLER research project. First, we give the brief motivation for integration work and reference the visionary Smart Life scenario of hypotetic personas' day from the year 2020. Presentation of identified security and privacy concerns of IoT deployments follows Smart Life scenario because of inevitable direct impact on large number of human end-users. Development objectives towards integration of heterogeneous IoT systems follow the defined scenario and are accompanied by IoT technical feasibility and user feedback validation targets and measurement values for the four to-be-deployed IoT applications. The architectural system overview of technological enablers of interoperability and interconnection between and within IoT applications are also important parts of the on-going research. The IoT application example gives an understanding on applicability of previously described considerations particularly in Smart Home domain. We round off with discussion on our developments at the end.

Keywords: Internet of Things, experimental deployments, heterogeneity, integration, validation.

1 Introduction

Active digitization and automation in all the life areas starting from the end of nineties has led to a number of specialized systems from different domains, from partially to totally incompatible with each other. In opposite, the vision of ubiquitous Internet of Things [1] implies the interdisciplinary system scalable to all areas of human activity. However, specific area impedes scalability because of the differences of logic processes in various fields and international differences. That is why the exemplary

focusing on different vertical domains like Smart Transport, Smart Health, Smart Shopping, Smart Home and Smart City is essential to show the ways for seamless integration of heterogeneous domain specific IoT technologies into one coherent technical solution facilitating the context-aware 24/7 information support for end-users while preserving privacy and anonymity. In order to achieve this ambitious goal for interconnection and integration of IoT applications BUTLER project is designing and demonstrating the first prototype of a comprehensive, pervasive and effective context-aware information system, which will operate transparently and seamlessly across various scenarios.

2 Defined Horizontal Scenario

Horizontality is technically understood as complementary data exchange between different application domains generating the added value through availability of the non-core (also called contextual) information for a given application domain. Horizontality is a key feature of BUTLER's Smart Life Vision for ubiquitous context-aware and secure IoT. Concretely, after several iterations the following multi-domain or horizontal scenario has been defined within BUTLER project based on the users' stories [2] and the initial IoT applications available [3]. This horizontal scenario serves as a conceptual target to be reached by the end of the project and the final IoT platform is meant to implement this level of horizontality.

Table 1. Horizontal Scenario

Donald is 51 years old, works at a bank, married with Daisy. They have 2 children. They live in a house and own a chalet in the mountains. He enjoys eating out, despite food allergies and is interested in energy efficiency.

Daisy is 45 years old, a housewife and part-time shop assistant. She is married to Donald and has 2 children. Daisy suffers from diabetes, tries to do fitness workouts regularly and likes shopping with her girlfriends.

Story: Donald lives together with his wife Daisy and the two kids in its own one-family house in a suburb of a bigger city. While he enjoys living and working near the city, he loves to spend his holidays in the mountains. They are just about to go there for a family skiing week...

Donald is at home; he uses his tablet to check on the chalet and recognises that the temperature is just 12°C. Is the heating broken? BUTLER should have started heating the chalet up. He turns on the heating manually over his tablet and a second later the system comes up with notification: The alternative wind energy he had chosen for the operation of the electric heating system is very expensive at the moment as there is not much wind to drive the wind farms during the next 5 hours. So that was the reason why BUTLER hasn't yet turned on the heating. However, the system predicts low energy prices for the night and still enough time to heat up the chalet to 20°C by tomorrow morning. It also gives Donald the opportunity to switch the energy source and/or turn on the heating anyway. No, that is not necessary.