Future Human-Centric Smart Environments

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Abstract. Internet of Things (IoT) is already a reality, with a vast number of Internet connected objects and devices that has exceeded the number of humans on Earth. Nowadays, there is a novel IoT paradigm that is rapidly gaining ground, this is the scenario of modern human-centric smart environments, where people are not passively affected by technology, but actively shape its use and influence. However, for achieving user-centric aware IoT that brings together people and their devices into a sustainable ecosystem, first, it is necessary to deal with the integration of disparate technologies, ensuring trusted communications, managing the huge amount of data and services, and bringing users to an active involvement. In this chapter, we describe such challenges and present the interesting user-centric perspective of IoT. Furthermore, a management platform for smart environments is presented as a proposal to cover these needs, based on a layered architecture using artificial intelligent capabilities to transform raw data into semantically meaningful information used by services. Two real use cases framed in the smart buildings field exemplify the usefulness of this proposal through a real-system implementation called City Explorer. City Explorer is already deployed in several installations of the University of Murcia, where services such as energy efficiency, appliance management, and analysis of the impact of user involvement in the system are being provided at the moment.

Keywords: User-Centric, IoT, Smart Buildings, Energy Efficiency, Context Awareness.

1 Introduction

The smart concept is flooding our life. Currently, everybody speak about smart cities, smart companies, smart transport, etc., whose main enablers are the last advances in Information and Communication Technologies (ICT) as well as proposals for the integration of sensors, actuators, and control processes. The world is being transformed at such speed that by 2015 is expected that over 50 billion devices are interconnected into a full ecosystem known as Internet of Things (IoT).

IoT represents a key enabler for smart environments, enabling the interaction between smart things and the effective integration of real-world information and
knowledge into the digital world. Smart things, instrumented with sensing and interaction capabilities or identification technologies, will provide the means to capture information about the real world in much more detail than ever before, which means it will be possible to influence real-world entities and other actors in real time.

The initial roll out of IoT devices has been fueled primarily by industrial and enterprise centric cases. For instance, a set of IoT application scenarios have been identified for their expected high impact on business and social benefits. These scenarios are showed in Fig. 1. Since some knowledge and services of different IoT scenarios can be shared and used in the other scenarios, all of them can be considered like linked, as it is reflected in Fig. 1.

![Fig. 1. IoT application scenarios with high expected business and societal impact](image)

However, the exploitation potential of IoT for smart services that address the needs of individual users, user communities, or society at large, is limited at this stage and not obvious to many people. Unleashing the full potential of IoT means going beyond the enterprise centric systems and moving toward a user inclusive IoT, in which IoT devices and contributed information flows provided by people are encouraged. This will allow us to unlock a wealth of new user-centric IoT information, and a new generation of services of high value for society will be