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Enabling energy smart cities through urban sharing ecosystems

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Abstract

In order to build real smart cities, heterogeneous data from different sources has to be properly collected, integrated and shared. In this paper, a real district scale example of urban sharing ecosystem based on coopetition is presented. This digital ecosystem enables data sharing that can be synergically applied to different sectors relevant to the urban context, e.g., energy and transportation, in order to create innovative solutions for energy monitoring, citizen engagement, and evaluation and monitoring at district and city level.

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1. Introduction

Recent advances in technology enable innovative digital scenarios that provide citizens and communities with cohesive and tailored solutions for their urban life. At the same time, technology is improving city management and monitoring from the standpoint of different urban stakeholders (e.g., city managers). In this direction, an innovative vision of a “clever and integrated” city has emerged under the name of “smart city”. A smart city is a sustainable urban center where every aspect of urban life is supported by Information and Communication Technologies (ICT) and governed in an efficient way, through integrated actions addressing building stock, energy systems, mobility, climate change, water and air quality etc. In order to achieve this goal, integration of information from various and distributed sources needs to be performed, and huge amounts of data have to be produced, elaborated, shared and consumed.

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2. Key challenges for Smart Cities

An important contribution to building smart cities is emerging even from advances in sensor technology and proliferation of smart metering devices, which provide easier access to valuable information about energy consumption and demand. Currently, smart grids represent a remarkable example of this scenario where several devices from different vendors, running different protocols and policies, are integrated in order to reach a common goal: bring together energy delivery and smart services. This potential has already been recognized by governments and industries, e.g., in the Green Button initiative [1]. This initiative is an effort to provide utility consumers with easy and secure access to their energy usage data and the ability to share such data with third parties. Smart meter data is provided to consumers in a standardized format, which facilitates data sharing, integration and reuse.

In order to extend the boundaries of data sources – including not only the Internet of Energy devices of smart grids, but also every sort of device, which can be part of what we can call the Internet of Everything – “Web of Things Architectures”, have been proposed [2]. In these architectures, a standard scalable Web protocols layer provides an abstraction mechanism to interact with heterogeneous connected “things”. This way, the technical issue of having access to different data sources is addressed, but political and relationship constraints of having access to third-party data are still to be solved. Moreover, a comprehensive and valuable data integration needs to take into account also data owned by heterogeneous stakeholders that are not strictly related to the energy field, e.g., public transportation players.

In this paper a real district-scale example of effective energy smart city solutions based on data sharing and integration is presented, proposing an innovative holistic approach to governing heterogeneous data sources provided by various stakeholders – e.g., players of building, public lighting and transportation sectors.

3. “Sharing Cities” H2020 project

“Sharing Cities” [3] is a 5 year Horizon 2020 project. It aims to take a digital-first and data-driven approach to overcome key environmental challenges facing cities such as carbon emissions from buildings and transport, and air quality [4]. The overall holistic goal is to integrate these issues and interventions, using data from a wide range of sensors and sources, by means of an ICT platform to enable their management according to an uncoupled distributed architecture in line with the Application Programming Interface (API) Economy trend. In doing so, the project will deliver cost savings in terms of energy bills, and by tackling and optimising demand will reduce the need to invest in electricity infrastructure. Citizen engagement is at the heart of the project, involving the co-design of services by residents and a digital bond scheme to ensure their take-up. Through the integration of different measures, and thanks to an API-based ICT ecosystem, new smart services will be available and it will be possible for citizens to access information to change their behaviour virtuously in order to produce a measurable environmental impact.

By taking a collaborative approach across the three lighthouse core cities (London, Lisbon and Milan) to the development of products and services, and rolling these out across the three follower cities (Bordeaux, Burgas and Warsaw), the “Sharing Cities” project aims to create the level of certainty and demand that will drive the market, turning an initial European Union investment of 25 million Euros to draw in 500 million Euros of external investments.

3.1. Objectives and goals

The “Sharing Cities” project has four key objectives [4].

- To achieve scale in the European smart cities market by proving that properly designed smart city solutions, based around common needs, can be integrated in complex urban environments. This will be done in a way that exhibits their true potential and allows for the significant scale-up and consequent increase in social, economic and environmental value.
- Adopt a digital-first approach which proves the extent to which ICT integration can improve and connect up existing infrastructure, as well as the design and running of new city infrastructure. This will also allow for the creation of a new set of next stage digital services which will help citizens and city managers make better and

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