

Preface

The title of this book is a pun on the use of the preposition “onto” with the aim of recalling “Ontology,” the term commonly adopted in the computer science community to indicate the study of the formal specification for organizing information about objects and entities.

The Ontology notion originates from philosophy, where it refers to the meta-physical study of the nature of being and existence. In computer science and more specifically in the field of knowledge engineering, ontologies are used for a quite different purpose, that is, for modeling concepts and relationships on some domain.

Year 2013 celebrates the twentieth anniversary of the World Wide Web. The simple network of hypermedia has transformed the world of communications with enormous implications on the social relationships; however, it soon showed its main drawback that, in the opinion of its creator—Tim Berners-Lee—is the lack of meaning in exchanged data when artificial agents are involved. Contents were designed to be read by humans and not to be meaningfully manipulated by computer programs.

With the introduction of the semantic web the meaningful contents are opportunely structured, in order to allow software agents roaming from page to page to readily carry out sophisticated tasks.

From an infrastructural perspective the traditional World Wide Web has experienced a further extension represented by the Internet of Things (IoT), today feasible thanks to the integration of the pervasive technology of sensor networks. Sensor networks are composed of several devices capable of sensing environmental phenomena, of performing small on-board computations, and of communicating with each other in order to cooperate.

Two different aspects, observable at two separate layers, characterize the Internet of Things. The physical devices connected to the *network* and the data they are able to collect and transmit constitute the raw infrastructure, deployed all over the globe.

The semantics of the collected data, the meaning of the actions they are able to trigger, their exploitation in ever-more challenging applications capable of dramatically changing everyday life, represent the real knowledge that human beings and even computers themselves may acquire.

The most important contribution of IoT regards the possibility of enabling more efficient machine-to-machine cooperation. To such aim, ontologies represent the

most suitable tool to enable transfer and comprehension of information among computer applications, even those designed and developed by unrelated people in different places.

It is thus possible to surf the sea of information available today in digital form without the intervention of a human being, thus accomplishing a real web of things.

This new paradigm uncovers new horizons for the development of visionary and challenging applications. Such new services, bridging the virtual and physical worlds, span various domains such as energy efficiency, health care, precision agriculture, and infrastructure monitoring.

This book proposes a collection of contributions illustrating different applications following these directions and that are the outcomes of real experiences developed in the context of research projects.

A relevant portion of the book contains papers illustrating the Internet of Things in the specific domain of Ambient Intelligence (AmI). AmI is a recent research field that considers the user as the focus of an environment equipped with pervasive devices, with the main goal of satisfying his requirements, and of assisting him in daily activities. The complexity of such a domain imposes the adoption of formal methods of knowledge representation; in such context, ontologies represent a useful instrument for overcoming the intrinsic difficulties arising from heterogeneity and dynamicity, thus effectively making the Internet of Things fully exploitable.

Papers presented in the first part of the book (1–15) fall within this group and have been discussed during a project workshop held in Palermo on October 29, 2013.

Furthermore, in order to reach a broader audience, we collected some other interesting contributions devoted to illustrate other compelling application fields, ranging from the tourism market to the public administration, from the thermo-solar plants to the multi-risk assessment.

We would like to thank all the authors for their contributions, which we believe represent interesting and stimulating advances in this cross-disciplinary field.

We also would like to thank all the colleagues for their invaluable support in reviewing the papers, and finally Dr. Alessandro Perricone for his help in the final editing.

November 2013

Salvatore Gaglio
Giuseppe Lo Re

Advances onto the Internet of Things

How Ontologies Make the Internet of Things Meaningful

Gaglio, S.; Lo Re, G. (Eds.)

2014, IX, 352 p. 125 illus., Softcover

ISBN: 978-3-319-03991-6