Semantic-enabled IoT Systems: an overview of recent initiatives and future directions

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***Abstract*— IoT Systems provide advantages in various application domains. This fast-growing ecosystem is leading IoT towards a promising future. However, IoT systems expansion opportunities are not straightforward. A set of challenges should be overcome to enable IoT mass-scale deployment across various domains including protocol and data-levels semantic interoperability, complexity handling, and scalability management. This talk aims at giving an overview of these challenges. Recent international standardization and R&D initiatives will be investigated. Future directions will be highlighted.**

Autonomic IoT Systems; interoperability; semantic.

I. INTRODUCTION

Significant advances have been achieved in information and communication technologies in the last decade. Recent advances include virtualization technology both at the processing and the communication levels as well as standardization. The progress in networking encompasses Machine-to-Machine (M2M) communications for Internet of Things and Big Data traffic that constitute active research and standardization domains in Europe by ETSI, and around the world by the global standards initiative OneM2M. The design and deployment of interoperable IoT solutions based on open systems and interfaces are identified as enablers for the digital market. The strategic application domains include e-heath [3, 6], connected and autonomous vehicles, advanced manufacturing, energy management and smart homes, buildings and cities. IoT Systems provide advantages in these various domains. Their adoption relies on the successful management of interoperability, complexity handling, and scalability.

The research objectives, in this context, involve elaborating design models and management solutions to discover, compose and manage, by semantic-enabled automated procedures, the properties of adaptability essential for autonomic reconfiguration in smart environments [1]. These properties are critical for highly dynamic software-intensive Systems of Systems [5] such as software-defined communication networks and IoT platforms, services and applications and can be implemented by model-based design approaches and ontology-based reasoning [7]. This research direction is of interest for many applications that, on the one hand, have eager reconfiguration requirements to manage mobility, ubiquity, adaptation [4], and self-healing [2], essential for autonomy, and that, on the other hand, are subject to non-functional constraints of Quality of Service (QoS), scalability and reliability. Our achievements in this domain include model-based multi-level reconfiguration solutions, in order to manage simultaneously and consistently the adaptation in the different communication levels. This is necessary for service continuity and end-to-end QoS that we implemented by coordinating the adaptation actions to meet the evolving of the context. We present, in this talk recent international standardization and R&D initiatives and highlight the related future directions.

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