Chapter 1.4
Semantic Web in Ubiquitous Mobile Communications

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ABSTRACT

The world becomes ubiquitous, and mobile communication platforms become oriented towards integration with the web, getting benefits from the large amount of information available there, and creation of the new types of value-added services. Semantic and ontology technologies are seen as being able to advance the seamless integration of the mobile and the Web worlds. We provide background information on the Semantic Web field, discuss other research fields that bring semantics into play for reaching the ontology-enabled ubiquitous mobile communication vision, and exemplify the state of the art of ontology development and use in telecommunication projects.

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INTRODUCTION

Nowadays, mobile and Web environments converge in one shared communication sphere. Technologies stemming from Semantic Web and Mobile Communication fields get combined to achieve this convergence towards the vision of ontology-enabled ubiquitous mobile communication. Knowledge Management and Semantic technologies fields produce ways to describe, specify and manage information in a machine processable form, in particular, acquire, evolve, reuse, and combine knowledge (Fensel, 2001). Certain formats and protocols stemming from these fields are already being applied to telecommunications: vCard[1], CC/PP[2], UAProf[3]. However, these specifications are only applicable to a limited number of telecommunication scenarios,

and management of information about resources in mobile environment could be substantially improved, e.g., by alignment of heterogeneous information sources in knowledge-based service enablers.

Ontologies and architecture knowledge layers play an ever-increasing role in service platforms and mobile communications. As integration of Telco, Internet and the Web takes place, in order to achieve interoperability, telecommunication systems and services tend to rely on knowledge represented with the use of shared schema, i.e., on ontologies similar to as envisioned on the Semantic Web (Tarkoma et al., 2007). However, specific ontology-based implementation solutions for mobile systems are rare, and best practices for such interoperability are not established. In this chapter, we address a problem of ontology-based interoperation in order to integrate independent components in a system providing value-added mobile services.

We present the overall state of the art ontology-related developments in mobile communication systems, namely, the work towards construction, sharing and maintenance of ontologies for mobile communications, reuse and application of ontologies and existing Semantic Web technologies in the prototypes. Social, collaborative and technical challenges experienced in the project showcase the need in alignment of ontology experts' work across the mobile communication projects to establish the best practices in the area and drive standardization efforts. We indicate certain milestones in integration of Semantic Web-based intelligence with Mobile Communications, such as performing ontology construction, matching, and evolution in mobile service systems and alignment with existing heterogeneous data models.

The chapter is structured as follows. In Section 2 we provide a motivation for discussing the convergence between the areas of Semantic Web and ubiquitous mobile communications. Section 3 gives an overview of the core ontology technologies involved, related and relevant research and development fields and challenges in the area. In Section 4, two illustrative case studies for the converged area are described. Section 5 concludes the chapter and Sections 6 indicates future research directions.

WHY SEMATICS IN UBIQUITOUS MOBILE COMMUNICATIONS?

In this section we motivate why combination of Semantic Web technology with ubiquitous mobile communications is beneficial. Semantic technologies in mobile communication have been somewhat considered to the less extent comparing to other fields, such as semantics in e-sciences, e-government, e-enterprise, e-communities, etc. However, as the mobile world starts to integrate with the Web world in delivering new value-added services, the area of semantics ubiquitous mobile communication inevitably gains a larger importance and potential.

Ubiquitous computing, also referred to as pervasive computing, is the seamless integration of devices into the users every day life. Applications should vanish into the background to make the user and his tasks the central focus rather than computing devices and technical issues (Weiser, 1991). When applying to mobile communication scenarios, ubiquitous computing can be viewed as when user moves around and changes circumstances, he can always be connected and well served without being aware of the technical issues under the scene. To achieve the goal, information from all the involving participants, such as user, network, service provider etc., needs to be collected, shared and interoperable with each other, known by one or more operational agents but agnostic to the user. Such information is diverse in their language, format and lack of semantic meaning for autonomous processing by computer or operational agent. The Semantic Web can be a rescue with its vision to achieve global information sharing and integration.

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