Chapter 31
Towards Semantic Mashups:
Tools, Methodologies, and State of the Art

Aikaterini K. Kalou
University of Patras, Greece

Dimitrios A. Koutsomitropoulos
University of Patras, Greece

ABSTRACT

Semantic Mashups constitute a relatively new genre of applications that illustrate the combination of the current trends of the Web, i.e. the Semantic Web and Web 2.0. The great benefit of Semantic mashups lies in the ability to aggregate different and heterogeneous data with rich semantic annotations and due to this, an additional ease of integration. In this paper, the authors attempt to outline the transition from conventional to semantic mashups, analyzing the former's limitations and identifying improvements and contributions which can come in with the advent of the later. Furthermore, the authors survey the background technologies on which semantic mashups are based, like Semantic Web Services and the process of data triplification. The authors also investigate the current trends and efforts put into developing tools and frameworks, which are designed to support users with little programming knowledge in semantic mashup application development, such as Semantic Pipes or Jigs4OWL. After presenting and illustrating the theoretical and technological background of this genre of mashups, the authors look into some use cases and systems. Among others, the authors present their mashup, called Books@HPClab, in which they introduce a personalized semantic service for mashing up information from different online bookstores.

INTRODUCTION

The Semantic Web (Berners-Lee, Hendler, & Lassila, 2001), according to the inspirator of the Web, Tim Berners-Lee, is an extension of the current Web, in which data are more easily machine-understandable, which means that machines can better process, "understand" and integrate the information that they simply display at present. In recent years, with the evolution of the Web 2.0, the maturity and the progress of APIs was a great opportunity for new genres of web applications, such as mashups, to emerge. A mashup is a Web-based application that is created

by combining and processing on-line third party resources e.g. APIs, Linked Data, etc. This kind of combination is not limited only to data but also to presentation or functionality.

A valuable approach of combining these two trends of the Web (Semantic Web and Web 2.0) is the enrichment of mashups with semantics. This kind of web applications is usually called semantic mashups. In the context of Web 2.0, users are usually characterized as consumers or producers, due to the fact that they can consume offered data so as to reuse/refactor them and produce new kinds of data or a novel application. Therefore, semantic mashups can offer users-consumers a wealth of different and heterogeneous data with rich semantic annotations which thus offering an additional ease of integration. The great proliferation of semantically enabled web services makes the development of semantic mashups an easier and straightforward process. Due to the large amount of available information on the Web, the need for personalization is more intensive than ever for Web search. So, the potential of Web personalization ensures that each user is considered as a unique entity taking into account his different information needs and tastes. Note also that personalized data is delivered more and more via Web, making this kind of personalization viable and effective. Since the idea of personalization is embedded within the very nature of the Semantic Web, semantic mashups can become paradigms upon which personalization services can be delivered more efficiently.

The general objective of this paper is to analyze the main characteristics of a semantic mashup and to give an introduction to the progress of mashups. In Section *Towards Semantic Mashups*, we refer to several drawbacks and limitations of conventional mashups that led to the development of semantic mashups. A set of corresponding requirements and specifications for the latter is then then identified and discussed. In Section *Background Technologies*, we survey the background technologies on which semantic mashups are based. Next, we present several approaches for semantic mashup development, including architectures, languages and design frameworks. Next, in Section *Semantic Mashup Tools*, we investigate the current trends and efforts put into developing tools designed to support users with little programming knowledge in semantic mashup application development, such as Semantic Pipes or Jigs4OWL. After presenting and illustrating the theoretical and technological background of this genre of mashups, we look into some use cases and systems in several domains of interest such as tourism or e-commerce. Among others, we present our mashup, called Books@HPClab, in which we introduce a semantic service for mashing up information from different on-line bookstores, producing personalized book recommendations and integrating them into the Linked Open Data (LOD) cloud.

TOWARDS SEMANTIC MASHUPS

Despite the efforts to alleviate the challenging and time consuming task of mashup construction, many limitations still obstruct mashup developers. Among the main drawbacks, that mashup developers have to overcome, are service interoperability, reuse, integration and mediation. Nevertheless, Semantic Web technologies seem to address these limitations. In this section, we make an effort to mention the limitations for conventional mashups. Driven by the need to overcome these obstacles, we then set the stage for the notion of semantic mashups and attempt to deliver a preliminary definition and specifications.

LIMITATION OF CONVENTIONAL MASHUPS

The most important limitations of conventional mashups are often inherent in the traditional mashup development approaches. Roughly, one can divide between two approaches, the *manual*

Related Content

Reducing Complexity and Achieving Higher Energy Efficiency in Wireless Sensor Network
Communications by Using High Altitude Platforms
Zhe Yangand Abbas Mohammed (2012). *Wireless Sensor Networks and Energy Efficiency: Protocols,
Routing and Management (pp. 329-338).*
www.irma-international.org/chapter/reducing-complexity-achieving-higher-energy/62743

Impact of Frame Duration and Modulation Coding Schemes With WiMAX Bandwidth Asymmetry
in Transmission Control Protocol Variants
Kailash Chandra Bandhuand Ashok Bhansali (2019). *International Journal of Wireless Networks and
Broadband Technologies (pp. 35-45).*
www.irma-international.org/article/impact-of-frame-duration-and-modulation-coding-schemes-with-wimax-bandwidth-
asymmetry-in-transmission-control-protocol-variants/237190

A QoS Guaranteed Call Admission Control (QOG-CAC) Algorithm for Broadband Networks
Aminu Mohammed, Yese Orduen Solomonand Ibrahim Saidu (2019). *International Journal of Wireless
Networks and Broadband Technologies (pp. 46-63).*
www.irma-international.org/article/a-qos-guaranteed-call-admission-control-qog-cac-algorithm-for-broadband-
networks/237191

Spectrum Sensing in Emergency Cognitive Radio Ad Hoc Networks
Sasirekha GVKand Jyotsna Bapat (2013). *Cognitive Radio Technology Applications for Wireless and
Mobile Ad Hoc Networks (pp. 86-102).*
www.irma-international.org/chapter/spectrum-sensing-emergency-cognitive-radio/78232

Using the Analytic Hierarchy Process Methodology to Assess the Drivers Affecting the
Implementation of Interactive Digital Television as a Commerce Platform
Ching Ju Chao, Chad Lin, Hao Chiang Koong Lin, Chyi Lin Shenand Cheng Hung Wang (2012).
International Journal of Wireless Networks and Broadband Technologies (pp. 42-51).
www.irma-international.org/article/using-the-analytic-hierarchy-process-methodology-to-assess-the-drivers-affecting-the-
implementation-of-interactive-digital-television-as-a-commerce-platform/90276