Chapter 8

Design of Web Services for Mobile Monitoring and Access to Measurements

Evelina Pencheva
Technical University of Sofia, Bulgaria

ABSTRACT

Provisioning of applications and value-added services for mobile (remote) monitoring and access to measurements data is supported by advanced communication models such as Internet of Things (IoT). IoT provides ubiquitous connectivity anytime and with anything. IoT applications are able to communicate with the environment, to receive information about its status, to exchange and use the information. Identification of generic functions for monitoring management, data acquisition, and access to information provides capabilities to define abstraction of transport technology and control protocols. This chapter presents an approach to design Web Services Application Programming Interfaces (API) for mobile monitoring and database access. Aspects of the Web Services implementation are discussed. A traffic model of Web Services application server is described formally. The Web Services application server handles traffic of different priorities generated by third party applications and by processes at the database server's side. The traffic model takes into account the distributed structure of the Web Services application server and applies mechanisms for adaptive admission control and load balancing to prevent overload. The utilization of Web Services application server is evaluated through simulation.

INTRODUCTION

The advance of Internet from a network of interconnected computers and mobile terminals, to a network of interconnected objects (things) enables provisioning of applications and value added services for mobile monitoring. Within the paradigm of Internet of things (IoT), the objects have their own IP addresses and identifiers, may be embedded in complex systems and use sensors (ITU, 2005; INFSO, 2008). These "smart" objects are able to recognize each other, communicate

DOI: 10.4018/978-1-4666-5884-4.ch008

with the environment, receive information about its status, exchange and use the information. The communication between objects may be limited to particular areas (Intranet of things) or may be publicly accessible (Galluccio, 2011; Li, 2012; Wang, 2013). The ubiquitous connectivity of objects requires integration between heterogeneous sensors as sources of information. Usually in IoT applications, sensors provide information from physically distributed dynamic processes and their interoperability appears to be a real challenge.

Extending IoT with the Web Services technology is a way to achieve interoperable communications between objects (Castellani, 2011). Web Services feature automated service discovery and composition as well as the ability to deal with heterogeneous sources of information. Embedding Web Services into IoT objects eases the integration of distributed dynamic processes. Embedded Web Services may be regarded as physical information servers in constrained nodes. They follow the REpresentational State Transfer (REST) style of software architecture for distributed systems. The usage of efficient payload encoding and Web linking format for constrained Web servers improves the performance of embedded Web Services (Shelby, 2012).

A lot of academic research has been conducted in the field of mobile monitoring services. However, most of the research studies different ways to collect and evaluate data, and different privacy issues that are related to data collecting but the distribution of data to third parties has had less attention. Fox, Kamburugamuve and Hartman (2012) suggest architecture of IoT system, where Web Services Application Programming Interfaces (APIs) are defined between sensors and a central controlling unit, and between the central controlling unit and applications. Works related to embedded Web services for IoT applications consider different application domains (Elgazzr, 2012; Agarwal, 2010, Ryu, 2012). Design of Web Services for IoT applications requires identification of generic functions for monitoring management, data acquisition and data transfer, and

access to information. The synthesis of generic functionality allows definition of abstraction that is independent of transport technology and control protocols.

Web Service technology is used for smart objects because of the expressiveness of the underlying principles. The usage of Web Services for resource constrained environment in which smart objects exist is a true challenge. There is a vast quantity of use cases for embedded Web Services in the area of mobile monitoring. The potential of mobile monitoring applications based on Web Services spans over different remote measurements and machine-to-machine communications. Telemetry is used in distant weather stations (Al-Ali, 2010; Schmutzler, 2008; Ciancetta, 2007) to transmit information about current temperature, humidity, wind, and green gasses concentration. Telemetry is also used in tracking systems (Kyusakov, 2011; Maciá-Pérez, 2007) to transmit fuel consumption data in order to optimize the routes and to save fuel costs, and as a consequence to reduce the pollution. Embedded Web Services for machine to machine communications and telemetry may be efficiently implemented in healthcare applications such as remote patient monitoring, ageing independently, personal fitness or disease management (De Capua, 2010; Ramos, 2011; Stoicu-Tivadar, 2012). By examining the results from the studies by Priyantha (2008) and Schmeltzer (2008), it is clear that the Web services are intended reasonably for smart objects and that the performance is suitable for the constrained resources.

The unified communication between databases such as DB2, MySQL, PostgreSQL, Oracle, SQLite, and application is provided by so called database abstraction layer. If an application programmer wishes to implement code for all database interfaces in order to provide flexibility and portability, then he or she has to tailor the code to the vendor-specific interfaces of the different products. The significant amount of work regarding the code implementation and tests might be reduced by a consistent API which forms the database

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/design-of-web-services-for-mobile-monitoring-and-access-to-measurements/103669

Related Content

uRun: A Framework for User-Generated Mobile Services in the Health and Fitness Domain
Alexandra Chapko, Andreas Emrich, Stephan Flake, Frank Golatowski, Marc Gräßle, Andreas Kohlos, Nico Laum, Christian Lerche, Carsten Rust, Jürgen Tacken, Dirk Werthand Carsten Zoth (2011). *International Journal of Service Science, Management, Engineering, and Technology (pp. 79-97).*
www.irma-international.org/article/urun-framework-user-generated-mobile/60737

Team Dispersion, Emergent States, and Performance in Virtual IT Service Provisioning Teams
Hugo Martinelli Watanukiand Renato de Oliveira Moraes (2022). *International Journal of Information Systems in the Service Sector (pp. 1-16).*
www.irma-international.org/article/team-dispersion-emergent-states-and-performance-in-virtual-it-service-provisioning-teams/287577

Impact of Internet Service Quality (IS-QUAL) on Client Satisfaction: Case from Indian Banking Services
Nilanjan Ray (2016). *Handbook of Research on Promotional Strategies and Consumer Influence in the Service Sector (pp. 371-388).*
www.irma-international.org/chapter/impact-of-internet-service-quality-is-qual-on-client-satisfaction/149737

E-Government in Croatia: Percieved Quality and Obstacles Among Younger Users
Jovana Zoroja, Ivan Strugarand Božidar Jakovi (2020). *International Journal of E-Services and Mobile Applications (pp. 85-96).*
www.irma-international.org/article/e-government-in-croatia/256178

Managing Intercultural Service Encounters: Establishing the Need for Intercultural Training
Suvenus Sophonsiriand G. Barry O'Mahony (2012). *Service Science Research, Strategy and Innovation: Dynamic Knowledge Management Methods (pp. 125-140).*
www.irma-international.org/chapter/managing-intercultural-service-encounters/61872