Chapter 7.18
Personalization of Web Services:
Concepts, Challenges, and Solutions

Zakaria Maamar
Zayed University, UAE

Soraya Kouadri Mostéfaoui
Oxford Brookes University, UK

Qusay H. Mahmoud
University of Guelph, Canada

Ghita Kouadri Mostéfaoui
Oxford Brookes University, UK

Djamal Benslimane
Claude Bernard Lyon 1 University, France

ABSTRACT

This chapter presents a context-based approach for personalizing Web services so that user preferences are accommodated during the performance of Web services. Preferences are of different types varying from when the execution of a Web service should start to where the outcome of this execution should be delivered. Besides user preferences, this chapter argues that the computing resources on which the Web services operate have an impact on their personalization. Indeed, resources schedule the execution requests that originate from multiple Web services. To track this personalization, three types of contexts are devised, namely user context, Web service context, and resource context. A fourth type of context denoted by security enables protecting the content of each of these three contexts. The objective of the security context is to report on the

strategies, which permit protecting, overseeing, and assessing the content of the contexts subject to management operations.

INTRODUCTION

With the latest development of information and communication technologies, academia and industry are proposing several concepts that can hide the complexity of developing a new generation of user applications. Among these concepts, we cite Web services, which are suitable candidates for achieving the integration of distributed and heterogeneous applications.

A Web service is an accessible application that other applications and humans can discover and trigger to satisfy various needs. It is known that Web services (also called services in the rest of this chapter) have the capacity to be composed into high-level business processes known as composite services. Composing services rather than accessing a single service is essential and offers better benefits to users (Casati, Shan, Dayal, & Shan, 2003; Maamar, Sheng, & Benatallah, 2004b). Composition addresses the situation of a user's request that cannot be satisfied by any available service, whereas a composite service obtained by combining a set of available services might be used (Berardi, Calvanese, De Giacomo, Lenzerini, & Mecella, 2003). For example, applying online for a loan requires identifying the Web site of the appropriate financial institution, filling in an application, submitting the application for assessment, and collecting the analyst's comments back for decision making and applicant notification.

Because users' expectations and requirements constantly change, it is important to include their preferences in the composition and provisioning of Web services. Indeed some users, while on the move, would like receiving answers according to their current locations (Maamar, Yahyaoui, & Mansoor, 2004c). This simple example sheds the light on personalization and its impact on making applications adjustable. Personalization is of types explicit or implicit (Muldoon, O'Hare, Phelan, Strahan, & Collier, 2003). Explicit personalization calls for a direct participation of users in the adjustment of applications. Users clearly indicate the information that needs to be treated or discarded. Implicit personalization does not call for any user involvement and can be built upon learning strategies that automatically track users' behaviors.

Personalization depends on the features of the environment in which it is expected to happen. These features can be about users (e.g., stationary, mobile), computing resources (e.g., fixed, handheld), time of day (e.g., in the afternoon, in the evening), and physical locations (e.g., meeting room, shopping center). Sensing, collecting, assessing, and refining the features of a situation permit the definition of its context. Context is the information that characterizes the interaction between humans, applications, and the surrounding environment (Brézillon, 2003). Prior to integrating context into Web services, various issues need to be addressed (adapted from Satyanarayanan, 2001): how is context structured, how does a Web service bind to context, where is context stored, how frequently does a Web service consult context, how are changes detected and assessed for context update purposes, and what is the overload on a Web service of taking context into account?

Web services composition and provisioning are a very active area of research and development (R&D) (Papazoglou and Georgakopoulos, 2003). However, very little has been accomplished to date regarding their context-based personalization. Several obstacles still hinder personalization, such as: (i) current Web services are not active components that can be embedded with context-awareness mechanisms; (ii) existing Web services composition languages (e.g., Web Services Flow Language [WSFL] and Business Process Execution Language [BPEL]) typically facilitate orchestration only, while neglecting context of

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