

## Chapter 21

# Towards a Contextual and Policy-Driven Method for Service Computing Design and Development

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### ABSTRACT

*Today, Web services are of interest to both academia and industry. However, little has so far been accomplished in terms of design and development methods to assist those who are responsible for specifying and deploying applications based on Web services in compliance with service computing principles. For this purpose, the authors developed in this chapter a method based on Context and Policy for Web Services known as CP4WS. In this method, policies manage various aspects related to Web services such as participation in composition scenarios and adjustment in response to environmental changes, and context provides the necessary information that permits for instance to trigger the appropriate policies and to regulate the interactions between Web services with respect to the current state of the environment. CP4WS consists of several steps such as the identification of user needs and the behavioral specification of Web services. Each step has a specific graphical notation that facilitates the representation, description, and validation of the composition operations of Web services. A case study that illustrates and highlights the use and originality of CP4WS, respectively, is provided in this chapter.*

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## INTRODUCTION

For the World Wide Web Consortium (W3C), a Web service *“is a software application identified by a URI, whose interfaces and binding are capable of being defined, described, and discovered by XML artifacts and supports direct interactions with other software applications using XML-based messages via Internet-based applications.”* In a short period of time, the development pace of Web services has proved quite spectacular (Papazoglou et al., 2007; Maurice et al. 2007; Dustdar and Papazoglou, 2008; Dustdar and Schreiner, 2005). Several Web services standards have been developed such as WSDL, SOAP, and UDDI (Curbera et al., 2002) and a good number of Web services projects have been initiated (Maamar et al., 2009a; Maamar et al., 2009b; Agarwal and Sprick, 2005; Mrissa et al., 2007; Tolk and D'Allo, 2005; Bentahar et al., 2008). The efforts of these standards and projects are primarily geared towards the development of solutions that would overcome the automatic-composition problem of Web services. Composition handles the situation of a user's request that cannot be satisfied by any single, available Web service, whereas a composite Web service obtained by combining available Web services may be used.

In this chapter we shed the light on the scarcity of design and development methods for Web services. This is due to a certain extent to the lack of campaigns that would raise the awareness level of the research community to the challenges associated with Web services design and development. Roughly speaking, methods provide some kind of roadmap to assist designers and developers in delivering Web services-based information systems as per end-users' needs and requirements. Nowadays, designers and developers are put on the front line of delivering a new generation of Business-to-Business information systems that would across organizations' boundaries. Generally, a method comprises a set of steps to carry out according to a certain chronology and adopts a

specific notation to comply with during graphical modeling. A graphical notation proves important as it facilitates discussions and validation exercises among design team members and with end-users, respectively. Throughout this chapter, we propose our design and development method namely CP4WS, which stands for Context and Policy for Web Services. CP4WS stems out of our previous works on Web services like those reported in (Maamar et al., 2005; Maamar et al., 2006a; Maamar et al., 2008; Mrissa et al., 2007), and stresses two major concepts which extend the Web services concept. These two concepts are Policy and Context. Policies are introduced to manage various aspects related to Web services such as participation in composition, semantic mediation, and adjustment in response to environmental changes, whereas context denotes the necessary information that permits, for instance, to trigger the appropriate policies and to regulate the interactions between Web services according to the current environmental state.

In CP4WS, an additional element, which we refer to as resource, is part of the design and development exercise of Web services-based information systems. A resource identifies a computing platform upon which a Web service operates. Since resources schedule the execution requests that Web services submit, Web services have to be constantly aware of the capabilities of and constraints on their designated resources. Resource assignment for long periods of time is by far not acceptable as the number of available Web services continues to grow, so the use of resources will become intensive (Limthanmaphon and Zhang, 2004).

The rest of this chapter proceeds as follows. The following section introduces the concepts of policy and context, discusses the rationale of adopting both concepts in CP4WS, and continues with a presentation of a case study. The subsequent section highlights the various steps that make up CP4WS. Some steps rely on graphical notations, which are illustrated through the case study as

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