Chapter XI

The MAIS Approach to Web Service Design

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ABSTRACT

This chapter presents a first attempt to realize a methodological framework supporting the most relevant phases of the design of a value-added service. A value-added service is defined as a functionality of an adaptive and multichannel information system obtained by composing services offered by different providers. The framework has been developed as part of the multichannel adaptive information systems (MAIS) project. The MAIS framework focuses on the following phases of service life cycle: requirements analysis, design, deployment, and run-time use and negotiation. In the first phase, the designer elicits, validates, and negotiates service requirements according to social and business goals. The design phase is in charge of modeling services with an enhanced version of UML, augmented with new features developed within the MAIS project. The deployment phase considers the network infrastructure and, in particular, provides an approach to implement and coordinate the execution of services from different providers. In the run-time use and negotiation phase, the MAIS methodology provides support to the optimal selection and quality renegotiation of services and to the dynamic evaluation of management costs. The chapter describes the MAIS methodological tools available for different phases of service life cycle and discusses the main guidelines driving the implementation of a service management architecture called reflective architecture that complies with the MAIS methodological approach.

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INTRODUCTION

The design and implementation of multichannel and mobile information systems presents cross-disciplinary research problems. The information system should support adaptivity, since the execution environment is characterized by continuous change, particularly in mobile and ubiquitous systems where it is highly distributed and characterized by a high heterogeneity in both technological platforms and user requirements. Therefore, concepts such as stratification and information hiding turn out to be inadequate, since it is almost impossible to identify and implement optimal built-in strategies. Moreover, non-functional requirements (performance, reliability, security, cost, and, more generally, quality of service) become more and more relevant, and the management of the resources of the system can no longer be hidden, but instead has to be visible and controllable at the application level.

The goal of the multichannel adaptive information systems (MAIS) project is the development of models, methods, and tools that allow the implementation of multichannel adaptive information systems. The information system functionalities are provided as services on different types of networks and access devices and are the result of the composition of services offered by different providers to build a value-added service.

This chapter presents a proposal to realize a methodological framework supporting the most relevant phases of the design of a value-added service. In particular, we focus on the support of creation (e.g., analysis, design, and development) of a service as an abstract service and on its use as an orchestration of a set of existing component services.

Within the framework presented, the design of value-added services is restricted to the abstract definition of their functional and non-functional features. Thus, the MAIS framework does not pay attention to specific implementation details, such as service location and service access protocols, or the component service actually selected during a specific information system use, since the selected service may change quickly in a loosely coupled information system. The framework is also focused on the design of deployment alternatives and on the monitoring and control of quality of service during execution.

The goal of the MAIS framework is to provide a first integrated view of design aspects which are not considered in an integrated methodological framework in the literature. In particular, the objective is to focus on the service selection phase and on the representation of quality requirements at a system level.

The chapter is organized as follows: the next section provides a survey of methodologies already proposed in the literature to deal with web service design and quality of service representation; then, we present the MAIS methodological framework covering the most relevant phases of the Web service life cycle; the subsequent four sections describe in depth each component of the methodological framework; and the last section draws conclusions and outlines future work.

RELATED WORK

Several approaches have been proposed in the literature for the design of Web services as composed services and of cooperative information systems based on a service-oriented approach.
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