

Constructing and integrating data-centric Web applications: methods, tools, and techniques

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Abstract

This tutorial deals with the construction of data-centric Web applications, focusing on the modelling of processes and on the integration with Web services. The tutorial describes the standards, methods, and tools that are commonly used for building these applications.

Tutorial outline

We focus on *data-centered* applications, i.e. those applications whose main mission is to enable the browsing of complex data collections, and therefore are directly relevant to a forum such as VLDB. We first address the development of Web applications which do not use Web services, and characterize *four orthogonal design dimensions* of such applications. We identify:

1. the *schemas* of the application data on the server and their mapping to pre-existing data sources;
2. the *business logic* of the application.
3. the *hypertexts* for navigating within them, thus generating the Web interface on the client;
4. the *styles of presentation* being offered to the user on the client.

Mixing these concerns is clearly a bad design practice, as each one is addressed by means of very different technologies, tools, and skills. Therefore, we advocate a *declarative approach to design where each dimension is separately considered*.

Next, we show how *data* and *hypertexts* can be modeled by means of WebML (Web Modeling Language), using the model and method introduced in [CF+02]. The core

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features of WebML are reviewed and exemplified, as a premise to the rest of the tutorial, focused on Web services, their composition, and their integration; we leave the style and presentation outside the scope of this tutorial.

We then address the issue of capturing the *workflows* (business logic) embedded in Web applications. Workflows are naturally associated with advanced B2C and B2B applications, where the order of interaction and the assignment of interactions to players is significant, and users become themselves actors of a business process. Such interactions frequently occur in Web applications, even in the absence of Web services.

Next, we introduce *Web services*, which are becoming the dominant technology for building distributed computations. We briefly describe the classical Web service standards stack (based on XML, SOAP, WSDL, UDDI), and concentrate on the four kinds of WSDL operations (one-way, notification, request-response and solicit-response). Using these abstractions, we show how it is possible to integrate Web services within a Web application, enabling this application to gather content from a remote site, and/or to present itself as a Web service for interaction with a remote site.

Finally, we concentrate on workflow-style composition of Web services; we focus on the most popular formalism for expressing such composition, BPEL4WS, which realizes the so-called *Web service orchestration*, where simple e-services can be composed to generate services of arbitrary complexity.

The tutorial illustrates, for each design step, the model, method, and best practice applied to a running example.

Reference

[CFB+02] S. Ceri, P. Fraternali, A. Bongio, M. Brambilla, S. Comai, M. Matera: Designing Data-Intensive Web Applications, Morgan-Kaufmann, December 2002.