Chapter 9

DESIGNING WEB APPLICATIONS WITH WEBML AND WEBRATIO

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9.1 INTRODUCTION

The Web Modeling Language (WebML) is a third-generation Web design methodology, conceived in 1998 in the wake of the early hypermedia models and the pioneering works on hypermedia and Web design, like HDM (Garzotto et al., 1993) and RMM (Isakowitz et al., 1995). The original goal of WebML was to support the design and implementation of so-called data-intensive Web applications (Ceri et al., 2002), defined as Web sites for accessing and maintaining large amounts of structured data, typically stored as records in a database management system, like online trading and e-commerce applications, institutional Web sites of private and public organizations, digital libraries, corporate portals, and community sites.

To achieve this goal, WebML reused existing conceptual data models and proposed an original notation for expressing the navigation and composition features of hypertext interfaces. WebML's hypertext model took an approach quite different from previous proposals: Instead of offering a high number of primitives for representing all the possible ways to organize a hypertext interface that may occur in data-intensive Web applications, the focus was on inventing a minimal number of concepts, which could be composed in well-defined ways to obtain an arbitrary number of application configurations.

This initial design choice deeply influenced the definition of the language and its evolution toward more complex classes of applications. Four major versions of WebML characterize the progression of the language:

- **WebML 1**: The original version comprised only a fixed set of primitives for representing read-only data-intensive Web sites; the focus was on the modular organization of the interface, navigation definition, and content extraction and publication in the interface.
- **WebML 2**: It added support for representing business actions (called operations) triggered by the navigation of the user; in this way, the expressive power was extended to support features like content management, authentication, and authorization.
- **WebML 3**: The introduction of the concept of model plug-ins transformed WebML into an open language, extensible by designers with their own conceptual-level primitives, as to widen the expressive power to cover the requirements of new application domains. This transition emphasized the role of component-based modeling and was the base of all subsequent extensions.
- **WebML 4**: The notion of a model plug-in was exploited to add orthogonal extensions to the core of WebML, covering sectors and applications not previously associated with model-driven development. For example, Web service interaction and workflow modeling primitives were added as plug-in components, to enable the modeling and implementation of distributed applications for multi-actor workflow enactment (Manolescu et al., 2005; Brambilla et al., 2006); other extensions pointed in the direction of multichannel and context-aware Web applications (Ceri et al., 2007).

A distinctive trait of the WebML experience is the presence of an industrial line of development running in parallel to the academic research. One of the original design principles of WebML was implementability, with the ultimate goal of bringing model-driven development (MDD) to the community of "real" developers. To achieve this objective, Politecnico di Milano spun off a company (called Web Models) in 2001, with the mission of implementing and commercializing methods and tools for model-driven development of Web applications, based on WebML. Even before then, WebML had been used for modeling and automatically implementing an industrial project, the Acer-Euro system (http://www.acer-euro.com), comprising the multilingual B2B and B2E content publishing and management applications of Acer, the number 4 PC vendor in the world.