ABSTRACT

This article demonstrates how the User Requirements Notation (URN) can be used to model business processes. URN combines goals and scenarios in order to help capture and reason about user requirements prior to detailed design. In terms of application areas, this emerging standard targets reactive systems in general, with a particular focus on telecommunications systems and services. This article argues that the URN also can be applied to business process modeling. To this end, it illustrates the notation, its use, and its benefits with a supply chain management case study. It then briefly compares this approach to related modeling approaches; namely, use case-driven design, service-oriented architecture analysis, and conceptual value modeling. The authors hope that a URN-based approach will provide usable and useful tools to assist researchers and practitioners with the modeling, analysis, integration, and evolution of existing and emerging business processes.

Keywords: business process modeling; goal-oriented analysis; scenario modeling; service-oriented architecture; use cases; user requirements notation

INTRODUCTION

Business process modeling (BPM) is a structured method for describing and analyzing opportunities of improving the business objectives of stakeholders, including providers and customers. BPM usually involves identifying the roles of users involved in the process, and the definition of activities (often described as workflows or services) that contribute to the satisfaction of well-defined business goals. Approaches for BPM are business-centric rather than technology-centric, although connections to designs and implementations (e.g., via mappings to workflow engines or Web services) are also desirable.

BPM approaches need to address the well-known W5 questions: Why do this activity? What should this activity be precisely? Who is involved in this activity? Where and when should this activity be performed? Additionally, a business process model should enable ways of (formally) analyzing the processes and goal satisfaction. Finally, business process models should be understandable to various stakeholders, including customers.

Several years ago, the standardization sector of the International Telecommunications Union initiated work toward the creation of a User Requirements Notation (URN) in the Z.150 series of Rec-
ommendations (ITU-T, 2003). The purpose of URN is to support, prior to detailed design, the modeling and analysis of user requirements in the form of goals and scenarios, in a formal way. URN is generally suitable for describing most types of reactive and distributed systems, with a particular focus on telecommunications systems and services. The applications range from goal modeling and requirements description to high-level design. An overview of URN with a tutorial example from the wireless communication domain is presented in Amyot (2003). Annex A also includes a summary of the notation.

URN has concepts for the specification of behavior, structure, goals, and non-functional requirements, which are all relevant for business process modeling. URN is, in fact, composed of two complementary notations that build on previous work. The first one is GRL, the Goal-oriented Requirement Language (URN Focus Group, 2003a). For the last decade, goal-oriented modeling has been a very active field in the requirements engineering community (Yu & Mylopoulos, 1998). One well-established language is the NFR (Non-Functional Requirements) framework, published in Chung et al. (2000). GRL includes some of the most interesting concepts found in the NFR framework and complements them with agent modeling concepts from the i* framework (Yu, 1997). GRL captures business or system goals, alternative means of achieving goals, and the rationale for goals and alternatives. The notation is applicable to non-functional as well as functional requirements.

The second part of URN is the Use Case Map (UCM) notation, described in URN Focus Group (2003b). The UCM notation was first defined by Buhr and his colleagues (Buhr, 1998; Buhr & Casselman, 1996) to depict emerging behavioral scenarios during the high-level design of distributed object-oriented reactive systems. It was later considered appropriate as a notation for describing operational requirements and services. A UCM model depicts scenarios as causal flows of responsibilities that can be superimposed on underlying structures of components. UCM responsibilities are scenario activities representing something to be performed (operation, action, task, function, etc.). Responsibilities potentially can be allocated to components, which are generic enough to represent software entities (e.g., objects, processes, databases, or servers) as well as non-software entities (e.g., actors or hardware resources).

Through an illustrative example, we will argue that URN presents suitable and useful features for modeling and analyzing business processes, and that it satisfies the goals of a BPM language. Our example is based on a WS-I (Web Services Interoperability) case study (WS-I, 2003a). This article describes usage scenarios defining the use of Web services in structured interactions and identifying basic interoperability requirements. It is sufficiently rich in order to exercise the various features of URN, but, at the same time, it is a simplified model of a supply chain management system that can be understood in its entirety.

In this article, we first give an overview of the supply chain management case study as well as of the corresponding UCM model we constructed. Then, we discuss how URN models can be used to analyze architectural changes. Service provisioning relationships for mapping the business process model to Web services are then explored before looking at paths to detailed service design and validation. We finally discuss related work and present our conclusions.
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