

# Integrating Entity and Role Viewpoints in Business Processes

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## INTRODUCTION

A business process is a standard way of organizing work in a business context. It consists of a number of tasks designed to produce a product or service (Rummler & Brache, 1995). Business processes cross functional boundaries in that they involve members of different departments; common examples are developing a new product, ordering goods from a supplier, and processing and paying an insurance claim (Davenport & Short, 1990).

Over the past few years a number of viewpoints have influenced the design of notations and languages for business processes (Bruno, 2011). Probably, the most popular viewpoint is the centralized one, whose standard representative is BPMN (Business Process Model and Notation) (OMG-BPMN, 2011). It considers business processes essentially as orchestrators of operational activities, which encompass human tasks and automated tasks. Human tasks are carried out by participants by means of graphical interfaces, and automated tasks are implemented with services. Orchestration is achieved by means of control flow elements which enforce rigid precedence relationships: in this context, a business process is like a master distributing the work among the participants in the process.

However, it is not easy for participants to understand their real involvement when they look at the model of a business process based on the centralized perspective. They can find their tasks in the swim lane associated with their role, but the activity flow for a given participant is hard to identify because the activity flows of all the participants are mixed. The participation of users in processes is made more evident, if the process is decomposed into several “role” components: this is the essence of the role viewpoint.

When processes are meant to operate on the business entities which form an information system,

as advocated by the notion of PAIS (Process-Aware Information System) (Dumas, van der Aalst & ter Hofstede, 2005), focusing on the identification and ordering of the business activities may not be the right way to start with an investigation of the intended business. A growing number of papers in the area of BPM (Business Process Management) suggest starting from the identification of the key business entities and of their life cycles consisting of states and transitions: this approach is referred to as entity viewpoint. The entity types and their life cycles come from experience and show how the actual entities evolve over time: the business activities, which are responsible for the state transitions, may be introduced in a subsequent step of analysis along with the business rules governing their execution. Business processes are not eliminated; they, instead, result from the combination of interrelated entity life cycles, and how to synchronize the states of the entities in a simple yet effective way remains an open issue (Bruno, 2013).

This article illustrates how the above-mentioned viewpoints can be extracted from a global model and to this end it presents a notation, named iBPN (integrated Business Process Notation). This notation is inspired by high-level Petri nets so as to take advantage of their ability of being state and action oriented at the same time (Jensen, 1997). In addition, a companion information model is provided in order to show the structure of the entities acted on by the business process, in terms of entity types, attributes and relationships. An example concerning the handling of the submissions of papers to conferences will be used to illustrate the construction of the global process model and then the extraction of the entity viewpoint and the role one.

This article is organized as follows. First it presents background information and the informal requirements for the example to be worked out. Then it illustrates the key modeling issues, the process model related

to the example, and the automatic extraction of the sub-models; finally it makes some consideration on future research directions and provides the conclusion.

## BACKGROUND

The notion of PAIS, which advocates a tighter integration between the areas of information systems and business processes, has brought about several lines of research whose leitmotiv is the shift from the centralized perspective to the data-centric one.

While in the centralized perspective the emphasis is placed on the activities and the control flow, what is important from the data-centric point of view is the discovery of the key business entities along with their life cycles.

In the case-handling approach (van der Aalst, Weske & Grünbauer, 2005), a process is meant to take care of a specific entity type (e.g. an insurance claim), called the process case: the process evolution depends on the state of the case and not only on the tasks performed (Künzle & Reichert, 2009).

The BALSAs framework (Hull, 2008) draws on the notion of artifact (Nigam & Caswell, 2003), which encompasses not only the informational aspects pertaining to a business entity (e.g. a purchase order), but also its life cycle made up of the relevant stages of its evolution. BALSAs adds services, which encapsulate units of work acting on one or more artifacts, and associations, which specify various kinds of constraints for the services. Moreover, the use of business rules to associate services with artifacts in a condition-action style is also proposed (Yongchareon & Liu, 2010).

A challenging issue in the data-centric perspective is the coordination of the life cycles of the business entities involved. Such coordination may take advantage of composition relationships so as to achieve mutual synchronization between the states of a compound object and those of its components (Müller, Reichert & Herbst, 2007).

In PHILharmonicFlows (Künzle & Reichert, 2011), the life cycles of the entities are described by micro processes made up of states and transitions, while business processes are defined with macro processes consisting of macro steps and macro transitions. A macro step is associated with an entity type and a particular state of its life cycle; at run time, a macro step refers to the entities being in that state. A macro

transition activates an output macro step only when the entities collected in the input macro steps satisfy certain conditions which are related to the structure of the entities. For example, an application enters the state rejected if all the reviews asked for it are in the state rejected: this is a case of bottom-up synchronization in that reviews are hierarchically subordinated to applications.

## INFORMAL REQUIREMENTS FOR THE EXAMPLE

The process under consideration is called Handle-Submissions and is meant to handle the submission of papers to a conference. An informal definition of its requirements is as follows.

1. When the process is started, the chairman has already been appointed and the reviewers have already been identified. In addition, four deadlines, d1, d2, d3 and d4, have already been established; d1 is the end of the submission period, d2 is the end of the reviewing period, d3 is the term for notifying the acceptance or rejection of the papers, d4 is the term for submitting the final versions of the accepted papers.
2. After the start of the process, authors may submit papers but they have to do so before deadline d1; in the same period, they may also update their papers or remove them.
3. At the end of the submission phase, the chairman may begin to assign the papers to the reviewers; the purpose is to get three reviews for each paper. The chairman produces three assignments for each paper: an assignment is related to one paper and one reviewer and includes the deadline for completing the review.
4. In case an assignment has not been fulfilled in due time, the chairman produces an additional assignment which is related to the same paper and directed to a different reviewer.
5. The papers become ready for evaluation when three assignments for them have been fulfilled. The chairman decides the acceptance or rejection of the papers before deadline d3.
6. The authors of the accepted papers should provide the final versions before deadline d4; if they do not, the papers are considered withdrawn.

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