Chapter 10
Cooperation Patterns and Adaptation Patterns for Service-Based Inter-Organizational Workflows

Boukedouma Saida
USTHB, Algeria

Oussalah Mourad
University of Nantes, France

Alimazighi Zaia
USTHB, Algeria

Tamzalit Dalila
University of Nantes, France

ABSTRACT
Modernization is an effective approach to making existing mainframe and distributed systems more responsive to business needs. SOA is an adequate paradigm that allows companies to tap into the business value in their current systems for rapid future changes to the business model. In their research works, the authors focus on the use of SOA to implement Inter-Organizational WorkFlows (IOWF). The goal is to take benefits from SOA advantages like interoperability, reusability, and flexibility to deal with process models flexibly enough. This chapter focuses on specific IOWF architectures: the “chained execution” and the “subcontracting.” First, the authors define Service-Based Cooperation Patterns (SBCP) suitable to these IOWF architectures; a SBCP is defined through three main dimensions: the distribution of services, the control of execution, and the structure of interaction. The second issue of the chapter consists of adaptation and evolution of IOWF process models obeying to the defined SBCP. Conformably to the three dimensions of SBCP, the authors define three classes of adaptation patterns: “service,” “control flow,” and “interaction.” Also, the authors particularly distinguish operations of evolution of process models based on two perspectives: the expansion of the global functionality of the process and the expansion of the cooperation. For implementation, the authors consider BPEL processes.

DOI: 10.4018/978-1-4666-4667-4.ch010
1. INTRODUCTION

SOA is a paradigm that supports software modernization (Rotibi & al, 2012) by providing flexible distributed and collaborative applications easily adaptable and reactive to changes. All companies that aim to stay competitive in their field of activity should increase their production and must be quickly responsive to change in order to best satisfy their potential customers. For that, they transform their legacy information systems into business processes based on SOA by rebuilding them or by using techniques of business process archeology (Pérez-Castillo & al, 2011). In our research works, we focus on flexibility of business to business (B2B) processes based on SOA.

Since many years, B2B applications have been promoted with the appearance of business oriented technologies such as workflow (WF) (Van Der Aalst, 2002) and web services (Alonso & al, 2004) supported by service oriented architectures (SOA) (Papazoglou & al, 2007). We are interested with structured cooperation (Eder & al, 2002) supported by the concept of inter-organizational workflow (IOWF), allowing a cooperation among several business processes attached to business partners, in order to reach a common objective according to a “winner-winner” policy.

In (Van Der Aalst, 99) and (Van Der Aalst, 2000), generic architectures of IOWF have been defined in order to support structured cooperation. These architectures are the capacity sharing, the chained execution, the subcontracting, the case transfer, the extended case transfer and the loosely coupled WF. These architectures implement different schemas of cooperation that can link business partners in B2B relationship and cover a large number of existing processes in several domains. In our works, we consider these generic architectures as basic patterns of structured cooperation; however in their initial form, these architectures were subject to criticisms because of their rigidity and the difficulty to adapt to changes (Chebbi, 2007).

Also, in a context of a dynamic and unstable environment, businesses are often faced with stressful situations like a breach of contract with a partner, a failure of the business process and the need of additional resources. Faced with these situations and others, companies must review their systems, their business processes and their cooperation with other business partners in order to make the required changes. Consequently, the WF process and the system implementing it must be flexible enough to support the necessary adjustments. These adjustments can cover four complementary aspects of IOWF process definition: data, process, interaction and organization. Here, we focus on flexibility on process and interaction aspects. Also, we define the flexibility of process models through three perspectives: adaptability, evolutivity and reusability.

Consequently, we have to reach two objectives: the first one is to define cooperation patterns supporting flexible models of IOWF corresponding to the basic architectures considered. The second objective is to implement adaptation mechanisms dedicated to support changes on IOWF models obeying to the cooperation patterns defined.

In order to deal with IOWF models flexible enough, we adopt an SOA-based approach to define a set of service-based cooperation patterns (SBCP); each of which is suitable to a specific IOWF-architecture among those considered. SOA allows organizations to overcome technical obstacles to change by improving interaction with other platforms and simplifying application architectures, thanks to the characteristics of services which are loosely coupled components, easily invoked through their interfaces, business oriented and platform independent; also the SOA paradigm supports integration, reuse and composition of services. We state that the basic IOWF-architectures considered can be implemented as global orchestration or distributed local orchestrations of services, according to constraints relative to each architecture. The current paper focuses on
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