51 A CARTOGRAPHY BASED METHODOLOGY FOR COLLABORATIVE PROCESS DEFINITION

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This paper presents a methodology dedicated to the specification of collaborative processes. The successful implementation of methodology requires information about partners and collaboration that takes place in network as well as a reference framework. Information is used to characterize collaborative behavior of partners while cartography contributes to describing the field of collaborative processes. To obtain this information, we apply two approaches: 1) direct gathering information from partners by analyzing their requirements in order to understand their expectation on collaboration and 2) extracting observable information from our "6naps" collaborative platform in order to understand how partners have been collaborating. Cartography will then use this information to propose a specific BPMN collaborative process dedicated to the collaborative context.

1 INTRODUCTION

Today companies open up more and more to their partners because of the global market evolution. The capacity of companies to collaborate efficiently with others becomes an important factor for their evolution and their ability to survive.

The basic problem of each partner in a collaborative network is to be able to establish connections with others (Touzi et al., 2007). Interoperability is mandatory to deal with these issues. The interoperability, according to (Konstantas et al., 2005), should not demand any special effort from users. It can be positioned as a way toward the integration concept (Vernadat, 2006) of information systems (IS) of different partners.

EBM WebSourcing business focuses on providing collaborative software dedicated to SMEs clusters. Thus, our goal is not only to develop the collaborative information system (CIS) to deal with the interoperability issues, but also to provide tools and method to facilitate the collaboration design.

A CIS as described by (Touzi et al., 2006), can be seen as a mediator of a collaborative network. Partners can continue using their own IS. The CIS provides its own services for managing the collaborative process, dealing with the partners' applications and transferring the collaboration data.

Since collaborative networks are complex systems, their design requires models' development as a help to better understand the area and as a basis for the

development of tools for better decision-making (Chamarinha-Matos et al., 2006, Ivanov et al., 2006). Therefore, we defined a methodology as shown in Figure 1.

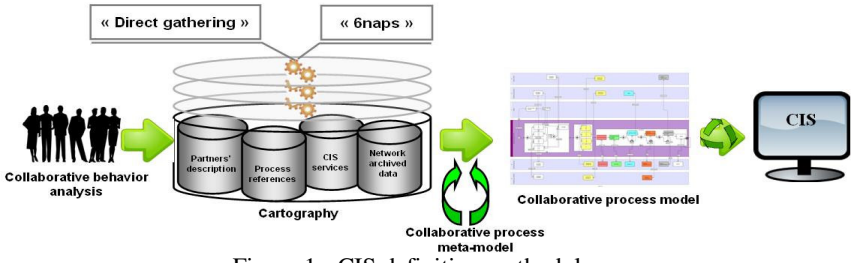

Figure 1 - CIS definition methodology

Our CIS definition methodology is composed of two parts developed separately but dedicated to the same final goal. The first part handles collaborative process model through the cartography. The second part addresses the transformation of collaborative process model using the translator to define a related CIS (Touzi et al., 2006). The collaborative process definition (BPMN based) becomes the link between them. The successful CIS definition requires the full implementation of the methodology.

The objective of this paper is to present the first part of the CIS definition methodology. We will introduce the concept of cartography which is a reference framework for developing two modeling approaches (direct gathering and "6naps"). These two approaches are based on the cartography and will be used as a decision-making tool for building collaborative process models.

2 CARTOGRAPHY: AS A REFERENCE FRAMEWORK

The objective of this section is to discuss about "cartography" which is the core concept of our collaborative framework. In this framework, we will define the references which are used for building collaborative processes.

From the definition of (Dudycha, 2003), cartography includes not only the use of maps as research tools and as sources of information, but also the study of maps as historical documents. This definition fits our vision of cartography which we would like to make as a reference framework. Our cartography tool takes the information about partners and their collaboration perspectives as input and provides collaborative processes (BPMN based) as output. The obtained BPMN should be compliant with the requirements of the partners and the CIS translator. Thus, we have to:

- Understand the collaborative behaviors of all involved partners and use the characterization criteria which have been classified and discussed in (Rajsiri et al., 2007) to analyze the behaviors.
- Integrate the *four modeling elements* in collaborative processes. These elements are actors (partners), exchanged data, collaborative services (provided by partners and CIS) and service orchestration (process).

These bring us to define our reference framework composed of: (1) Collaborative Network Building-up Platform (CNBP) and (2) Knowledge Base (KB), both being designed to support each other as shown below:

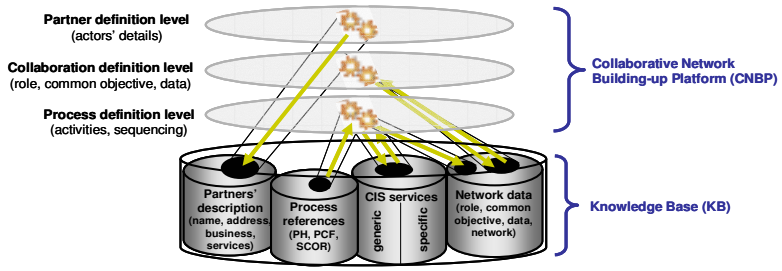

Figure 2 – Cartography with CNBP and KB

2.1 Collaborative Network Building-up Platform (CNBP)

The CNBP is a modeling space used for defining collaborative networks at three levels: partner, collaboration and process. It can perform two operations: supplying and seeking. The arrows in Figure 2 indicate the two directions of information pointing to the KB and CNBP for supplying and seeking respectively.

The *"Supplying operation"* is in charge of providing collaborative behaviors to the related KB. For example, at the Partner definition level where actors of network are identified, it supplies all actors' details for the Partners' description database (KB) while at the Collaboration definition level, we determine common objective of partners, the description of data transmissions as well as their semantic description to be contained in the Network database (KB).

The *"Seeking operation"* is in charge of searching for the desirable information, which concerns four modeling elements, from the KB. This operation focuses on completing collaborative network modeling. For instance, the Process definition level is where we define for example process elements (e.g. activities) by consulting the Process references and the CIS service databases (KB).

2.2 Knowledge Base (KB)

The Knowledge Base is composed of four databases relating to the four modeling elements described previously. It contains different kinds of information which can be filled in the KB and used by the CNBP as described above.

The Partners' description database is where the general descriptions of partners who perform a collaborative network are archived. The descriptions, consisting of company name, size, address, primary business and partners' offering services, will be contained in this database for the whole life cycle of collaborative network. The services contain also their descriptions concerning port, data type, message, etc.

The Process references database contains some generic references, such as the references provided by the Process Handbook[i] (PH), PCF (Process Classification Framework), SCOR (Supply-Chain Operations Reference-Model). These references are classified in business sectors.

The CIS services database is composed of two sub-databases: (1) the *CIS generic service database* which is immediately available and contains the standard services defined by EBM WebSourcing such as send/receive mails, and manage documents (2) the *CIS specific service database* which is an addable database. The

last one contains description of services which will be determined upon the needs focusing on completing and supporting the collaboration between partners, for example a "payment validation service" in a customer/supplier process. Once a new CIS specific service is specified, its description will be archived in this base for using afterwards.

The Network database is where all collaboration details including semantic description (ontology concept) of collaboration data, common objectives and role of partners are archived. This database is significant because it offers backtracking possibilities afterwards.

We implement two approaches ("direct gathering" and "6naps") in our cartography tool in order to provide assistance to a consultant of EBM WebSourcing using the collaborative process simulator. We will detail, in the next section, these two approaches which are developed with different modeling methodologies, but both taking into account collaborative behaviors of involved partners.

3 MODELING APPROACHES USING CARTOGRAPHY

This section aims to present two approaches which have been developed on the basis of the CNBP for using as a tool for better decision-making while building collaborative networks. The KB will be introduced according to the CNBP operations (supplying or seeking) as discussed in Section 2. Thus, we focus here on applying these two approaches for analyzing collaborative behaviors by using the reference framework to model a collaborative process related to the partners.

The first approach relies on partners' requirements analysis to understand their expectation on collaboration, while the second one uses tracking information from the running "6naps collaborative platform" to extract automatically knowledge about on-going collaboration behavior.

Before going into detail about these two approaches, we would like to talk briefly about GMF[ii] (Graphical Modeling Framework) technology. GMF is a graphic editor framework built on Eclipse. We develop a simulator with this tool to support our modeling methodology that allows to define and visualize collaborative networks. It is based on the collaborative network meta-model which contains the four modeling elements discussed in the beginning of page 3.

3.1 Direct Gathering from Partners

This approach focuses on how to describe a collaborative network in response to a common business objective. Figure 3 shows the five steps of the collaborative modeling methodology by gathering the information, at the beginning, about partners themselves and their collaboration requirements. We can find also in the figure the application of tools, the KB and the operations of the CNBP (see legends in the figure). We will introduce in each step the description of what we do and corresponding definition levels of the CNBP and database of the KB.

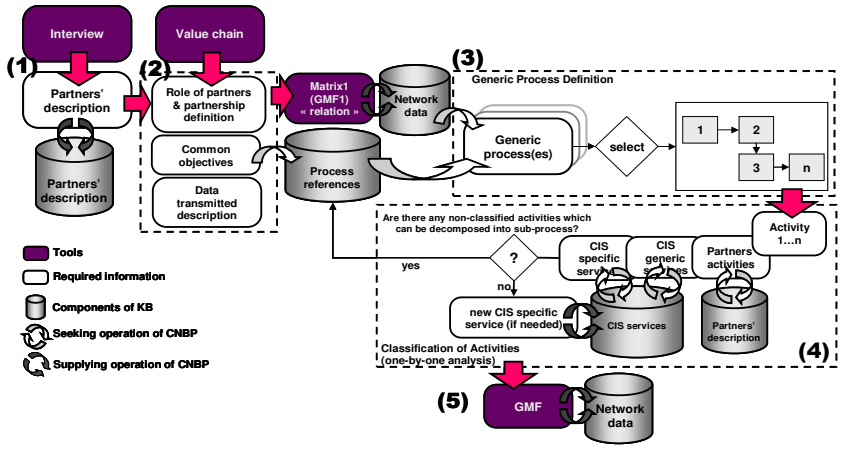

Figure 3 - Direct gathering methodology

Step1 – general description gathering

To collect the details about company name, primary business, address and size, the partners will be interviewed individually. This step addresses the Partner definition level (CNBP). These details will be stored in the Partners' description database (KB).

Step2 – role positioning and common objective defining

The Collaboration definition level (CNBP) starts at this step. We get all partners together in order to gather the information concerning role, relationship as well as common objective. The role and competency of each partner will be identified by means of the value chain of (Porter, 1986). A relationship performed between partners will be also determined pair by pair. Then, a common objective, as same as the transmitted data, will be jointly specified by all involved partners. All of the information will be graphically represented by a GMF based Matrix tool and stored in the Network database (KB).

Step3 – a generic process specifying

We are now at the Process definition level (CNBP). Generic processes will be deduced from the Process references database (KB) by using the common objective defined in Step2. Then, a generic process that fits the most to the common objective will be selected and used for analyzing in the next step.

Step4 – activity analyzing

We are still at the Process definition level (CNBP). From the generic process, the activities will be analyzed one by one. This analysis allows us to classify the activities according to the role of partners and CIS (who is capable to perform them?). The roles have been already defined in Step2 and stored in the Network database. If there are any non-classified activities, we have to redo Step3 but the objective will be changed to how to perform those activities.

For example, if in a buying process we cannot classify a "select supplier activity" to anyone, the new objective "how to select supplier?" is set. Then, we seek from the Process reference database (KB) for a supplier selection activity in order to decompose it into sub-activities. Then, redo Step 3 and loop if needed.

However, if we cannot decompose non-classified activities into sub-activities, we have to create CIS specific services for performing these activities. After the classification has been done, the partners' activities (or services) will be stored in the Partner description database (KB) while the CIS generic and specific services will be stored in the CIS service database (KB).

Step5 – collaborative network representing

The graphical tool will be used again for describing the network that represents all partners' and CIS services as well as data transmitted between services. When all partners have been agreed to an offered network solution, it will be archived in the Network database (KB). However, more than one solution is possible.

Figure 4 presents an example of a group buying network. The common objective of this network is to group similar orders of customers to buy from a selected supplier. We used this common objective to define a generic buying/selling process including all required activities from the Process reference database (KB). After having performed the iterative classification of activities, we obtain the network as follows:

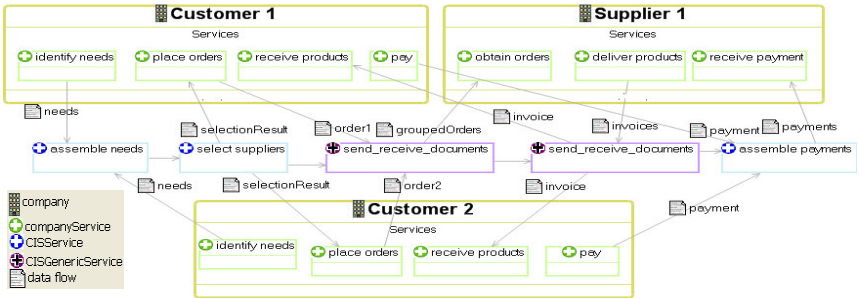

Figure 4 – Network of a group buying (printed screen of the GMF tool)

3.2 "6naps" Collaborative Platform

6naps is a collaborative platform developed by EBM WebSourcing based on the social business network paradigm. It aims to provide a trustable space for members to establish (or not) commercial relations among them.

To be able to access the platform, companies have to subscribe. The companies will be requested to provide during subscription some general descriptions of themselves, their business sector, services offering, etc. These details will be stored in a repository of the platform and are accessible by the members. After subscribing, companies can invite others to join their network, perform the partnerships, visualize their networks, use the services offered by the platform such as shared space, etc.

When collaboration occurs between two or more partners, the platform will record some data (e.g. size of payloads, number of occurrences of transmission) at runtime. Partners can request some services provided by the platform in order to execute their operations, such as send/receive documents, search partners and send/receive mails.

We use this platform in order to extract collaboration information that occurs in reality (see Figure 5) at two stages: subscription and collaboration stages. Some details of extracting and terms of reference (the three definition levels of the CNBP

and the four databases of the KB) of the cartography will be introduced in each stage.

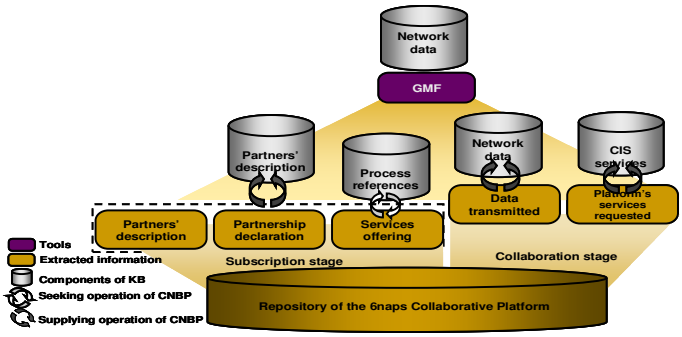

Figure 5 - "6naps" extraction methodology

At the subscription stage, we can extract and store all of the information about partners themselves, their relationships with other members and offering services in the Partners' description database (KB). Semantic relation between offering services and the Process reference database (KB) should be verified before being stored in the Partners' description base. This stage concerns the Partner and Process definition levels (CNBP).

At the collaboration stage, we can extract information from the runtime recording, of collaboration data which occurs between partners and platform's services. These platform's services can be considered as CIS generic services. All transmissions will be stored in the Network database (KB). This stage concerns the Collaboration definition level (CNBP).

After having extracted the information at these two stages, the GMF tool is used to structure that information for showing all transactions taken place between partners in a form of collaborative network. This phase is at the Process definition level (CNBP). The collaborative network that we obtain here describes the real collaboration between partners and will be archived in the Network database (KB).

As shown in the Figure 6, two companies (A and B) perform customer/supplier partnership and start transmitting mails in order to follow up the orders. The "6nap" platform offers send/receive mails service for operating these transmissions. An example of extracted information while transmitting mails is presented as follows:

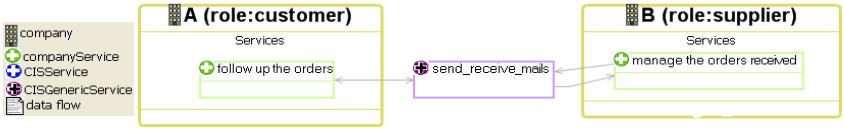

Figure 6 – Network of mail transmissions (printed screen of the GMF tool)

4 CONCLUSION AND ON-GOING RESEARCH

The output from the two approaches presented in the previous section is a collaborative network described by using the GMF tool. Obtained collaborative

networks have to be transformed into collaborative process models (BPMN based). As such a collaborative process model is an input of the CIS translator..Thus, a *meta-model of collaborative process* is needed to be applied for accomplishing this transformation (see Figure 1). The application of the collaborative process meta-model (Touzi et al., 2007) can guarantee that the collaborative process models obtained at the end will be compliant with the translator.

The meta-model of collaborative processes is in progress. Our current work is focused on developing a prototype of cartography and implementing the two modeling approaches to several collaboration cases. After that, we will handle the transformation of collaborative networks into BPMN collaborative processes.

5 REFERENCES

1. Dudycha DJ. Introduction to Cartography and Remote Sensing: Definition and Scope of Cartography, University of Waterloo, 2003.
2. Camarinha-Matos LM, Afsarmanesh H. A modeling framework for collaborative networked organizations, PRO-VE'06-7th IFIP Working Conference on Virtual Enterprises, 2006.
3. Ivanov D, Kaeschel J, Sokolov B, Arkhipov A. A conceptual framework for modeling complex adaptation of collaborative networks, PRO-VE'06-7th IFIP Working Conference on Virtual Enterprises, 2006.
4. Konstantas D, Bourrières JP, Léonard M, Boudjlida N. Interoperability of enterprise software and applications, INTEROP-ESA'05, Geneva Switzerland, Springer-Verlag, 2005.
5. Porter M. L'avantage concurrentiel, InterEdition, Paris, 1986, page 52.
6. Rajsiri V, Lorré JP, Bénaben F, Pingaud H. Cartography for designing collaborative processes, accepted paper for INTEROP-ESA'07, Funchal Portugal, March 2007.
7. Touzi J, Lorré JP, Bénaben F, Pingaud H. Interoperability through model based generation: the case of the Collaborative IS, INTEROP-ESA'06, Bordeaux France, 2006.
8. Touzi J, Bénaben F, Lorré JP, Pingaud H. A Service Oriented Architecture approach for collaborative information system design », accepted paper for IESM'07, Beijing China, May-June 2007.
9. Vernadat FB. Interoperable enterprise systems: architectures and methods, INCOM'06 Conference, St-Etienne, France, 2006.

[i] Process Handbook online : http://ccs.mit.edu/ph/
[ii] www.eclipse.org/gmf