Automatic Service Configuration under e^3value approach

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Abstract. The VALUE-IT project is addressing the problem of developing techniques to allow adaptive service configuration using e^3value support. Such a service configuration also must match with specific consumer needs. In this sense, the first step is to deal with the problem of designing techniques to perform automatic service configuration. Consequently tasks related with IT elicitation, reuse of knowledge, service configuration and evaluation of configured services must be solved.

Key words: service configuration, e^3value, reuse of knowledge.

1 Introduction

The VALUE-IT project addresses the problem of automatic service bundling focused on the value perspective. This research project is a collaborative effort between three universities at The Netherlands[1]. The main point in the VALUE-IT project is the idea about developing techniques to allow adapting service bundling. However this work only deals with automatic service configuration based on value models, which is a piece of all the process. In this sense, providing service bundles will be addressed based on business value and business process perspectives. A service bundle is conceived ,at least in this research, as a single package of one or more services.

Value-driven service configuration has been addressed in last years [1–3]. On the one hand some results present semi-automatic frameworks but without reuse of knowledge, thus for each problem almost the complete process must be performed [1, 2]. On the other hand, there is also one approach about reusing knowledge, however these results are more theoretical [3]. Therefore, at this point, there is no solution to automatically perform this task, being this research a novel approach to cover the gap between theoretical frameworks and practical implementation. Furthermore, this research also deals with a real-world and relevant case study. In short, the VALUE-IT project has one case study related with Intellectual Property Right (IPR) fees in the music industry (SENA case study).

[1] Vrije Universiteit Amsterdam, Universiteit van Tilburg and Universiteit Twente.

The rest of the paper is organized as follows. Section 2 presents a brief explanation about the research problem to be solved. Related work is presented in Section 3. Section 4 describes some ideas about how the research problem can be addressed. In Section 5 one case study related with the music industry is explained. Afterwards, Section 6 depicts the value model that is attempting to solve the case study. Finally Section 7 summarizes conclusions and future work.

2 Research Problem

According to the addressed problem, the phase of automatic service configuration, under the e^3value approach, will be covered answering to the following issues.

2.1 Elicitation of IT consumer needs

Consumer needs are commonly represented in abstract terms that must be translated to a computer-readable domain. For instance, given a user need defined as "To get communication facilities", several interpretations can arise. In the same way, alternative solutions can be performed to cover this need. Consequently, it is necessary to design some technique which allows mapping from abstract representations to specific IT consumer needs. In short, the final goal of this phase is to come up with a technique to allow a computer-readable interpretation of consumer needs under a specific context.

2.2 Automatic composition of value constellations

Once a computer-readable interpretation of a consumer need is gotten, the second phase is to perform some alternative solutions to cover this consumer need. One of the important points in the VALUE-IT project is the idea about configuring services based on the e^3value theory. Thus, to match the consumer need with a set of service providers composing a value web. In a *value web*, service providers show what objects of value they can exchange and also what they expect in return. As can also be observed, there could be several ways in which service providers can cover a consumer need. When a set of service providers cover a consumer need they form a *value constellation*. In this sense, a value constellation is a subset of a value web.

Therefore, deriving several value constellations from a single value web is a way to address the problem of performing alternative solutions. In addition, the VALUE-IT project is trying to apply techniques of knowledge reuse to guide the process of building alternative value constellations [4]. The approach for reusing knowledge is related with the design of value skeletons [5]. A *value skeleton* shows, given a consumer need, how that need is satisfied by providing valuable services by multiple enterprises. There is a hypothesis about the possibility of abstracting common service relationships in the task of service configuration.

This abstraction of common relationships between service providers can be represented using value skeletons. Consequently, the final idea is about how to match a consumer need with a set of value skeletons (library) to generate a set of alternative value constellations.

The problem of automatic service configuration has been addressed from several perspectives. As far we know, there are mainly two perspectives under the e^3value methodology. The first one is focused on the supplier point of view [2], i.e. how a set of enterprises can cover consumer needs. The second one deals with the consumer perspective [6], i.e. how users can satisfy this need. Both of these techniques bring about semi-automatic and also context dependent solutions. The VALUE-IT intention is to achieve as much as possible application-supported solutions, however it is well-known that context dependent relationships will be present. Furthermore, these approaches do not implement reuse of knowledge, which is one of the main contributions in this research.

To sum up automatic service configuration, based on this point of view, is about matching consumer needs with value skeletons to compose alternative value constellations. In this phase it is desired to apply techniques about skeleton design, skeleton storing/searching and problem solving [4].

2.3 Choosing between value constellations and coordination processes

The final step in this research is about how to select one value constellation and one coordination process to provide one single service. In order to carry on with this point, it is necessary to design some kind of ordering process to choose one value constellation. Afterwards, a coordination process must be also selected from a set of alternative coordination processes.

At this points it is important to take into account some issues. First, ordering of value constellations must be mainly based on financial aspects, *i.e. net value flow*[2], to assess good profits for each service provider in the value constellation. Second, ordering for choosing a coordination process must be based on several aspects like consistency between models (the value model representing the value constellation and the coordination process) and QoS requirements to deploy the desired service. The consistency between models is still a open question that must be addressed. Nevertheless, to be consistent, a process model must at least represent each one of the value exchanges in the value model.

It is important to say that the phase of building coordination processes will be covered by current research performed at the University of Twente. They will provide a library of process skeletons to build process models. Thus, this phase is part of a collaborative research.

Finally, Figure 1 depicts the set of required steps to perform automatic service configuration based on value models. On the one hand, the steps *b,d* and *f* are the key points to address in this research. They are related to the issues described in section 2. On the other hand, steps *c,e* and *g* are the results provided for each

[2] e^3value tools currently allow such calculation.

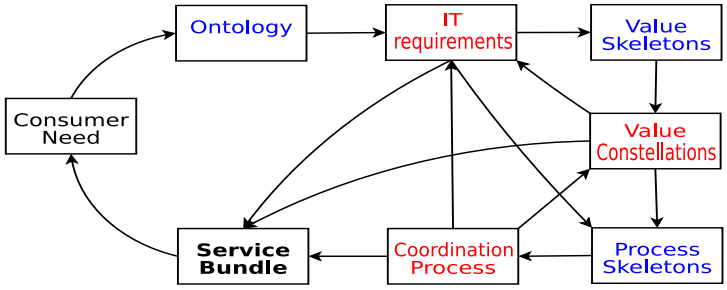

Fig. 1. General tasks to allow automatic service configuration.

key point. In the same way a and h represent the input and output of all the process. It is important to note that feedbacks from e to c, g to e and g to c represent a continuous revision process to assess consistency in each step.

3 Related Work

The first guideline to deal with the problem of IT elicitation is the $e^3service$ ontology [6]. This ontology allows to represent consumer needs in terms of IT services, however the process to infer from consumer needs to IT services is more theoretical than automatic. Thus, in order to allow automatic reasoning, improvements to this framework must be performed.

About the problem realted with automatic service configuration, some results based on skeletons have already been addressed [1]. Omelayenko's work introduces the notion of skeletal planning based on exploring several service configuration solutions using a skeleton. However this skeleton only depicts actors and basic relationships among them, so without taking into account the value perspective. About reusing knowledge Omelayenko's work also does not provide any mechanism to explore among several skeletons. Consequently, each skeleton can only solve one single configuration.

There is also another work that deals with the problem of reusing knowledge and guided configuration [3]. Zlatev proposes the concept of patterns to reuse knowledge. A pattern is considered as a recurrent design fragment that solves a problem in a particular context. In this sense, Zlatev's work focuses on designing a library of patterns, these patterns are represented with value models and goal models as well. The service configuration task is guided by a goal model representing some approximation of the desired service bundle to be developed, therefore some parts of that model are matched with the goal-model representation of the patterns. This methodology looks like a good solution, nevertheless, all the process requires a lot of human intervention, so there are neither automation nor implementation for the process.

Finally, problems related with consistency between value and process models have been broadly explored [7–9]. However, there is not a good solution to allow an automatic procedure.

4 Methodology

The main research tasks in this project will be followed by a *bottom-up* approach. Thus, in order to deal with the point related to *IT elicitation*, an exploring process must be performed. This exploring process will provide knowledge about consumer needs in the case study, and the IT services that can match with these needs. To carry on this problem, the first approach will be design an ontology to abstract main aspects of each consumer need and afterwards to map them to a catalog of IT services. What will be obtained is a set of IT services required to cover consumer needs, *i.e. IT requirements*.

The second issue in this research will be also covered with a bottom-up approach. The main part of this issue is about *reusing knowledge*, and the design of a framework to guide the process of service configuration based on *skeletons*. Therefore, for each case study a library of *value skeletons* will be designed, starting with the abstraction of the main aspects of each configured service until come up with a set of *value skeletons*. As already mentioned, the output of this process will be a set of alternative *value constellations* than can cover a set of *IT requirements*.

The last issue in this research will be performed in collaboration with the University of Twente. Some points to take into account are: design of process models based on value models, *matching* value models with process models, *selection* of one value and one process model. The first point is also about a bottom-up process. In order to build a library of process skeletons, for each value model, it is necessary to design a process model. However, as already mentioned, this task will be covered by the University of Twente. Consequently, the focus of this research is more about matching and choosing models. To deal with the problem of matching some steps must be performed. First, to design a mechanism to jointly explore the set of value constellations and the set of alternative process models. Second, to also design a mechanism to check consistency between value models and process models.

Summarizing, the main tasks will be performed based on action research. It is, solving our research questions in a cyclic phase. Firstly designing our mechanisms to solve the problems, secondly applying these mechanisms, thirdly evaluating their performance and finally if it is necessary to start with a new designing phase and so on.

5 Case Study

In the VALUE-IT project there is a case study related with the music industry. This case study deals with the problem of clearing Intellectual Property Rights

(IPR), thus it involves two steps: *collecting* fees from IPR users, *i.e.* radio stations, bars, discotheques and so on, and *repartitioning* all these fees to Right Owners, *i.e.* artists, song writers, producers. This process is already performed by IPR societies, and is called *clearing tracks*. The main IPR society interested in this problem is SENA[3]. Therefore, some times this case study will be referred as SENA case study.

Some results about how to model this case study have been already provided [10], however these results only address one of multiple configurations that can emerge in the music industry, such as new actors performing less or more activities because of market liberalization. On the other hand there is a new need for SENA, the process of collecting and repartitioning fees is currently based on reports provided by IPR users without any validation, *i.e.* trust problems. In this sense, SENA wants to know how many times each specific track is played, consequently a new model to deal with this problem must be designed, and also market liberalization phenomenon must be taken into account.

6 Value Model

The first results are about the SENA case study. According to current SENA requirements, a new business model was designed. The business model is based on the e^3value methodology, consequently it depicts the main actors and the objects of value they exchange to each other.

As can be observed in Figure 2, receivers are the starting point, they require to broadcast background music which is provided by background music providers. This relationship is summarized as follows, a Receiver gives a fee to a BMP and gets in return background music.

A BMP can provide background music in two ways. It can either deliver a set of tracks or a stream of tracks. In this sense, a set of tracks must be considered such as a physical device in which the Receivers store tracks provided for BMPs. On contrary, a stream is a flow of tracks that the BMP delivers to Receivers using internet-based technology. So, the main difference between these two ways of providing music is either allowing to store tracks at Receivers or not.

This main difference also generates two value chains between a BMP and IPR Societies. If the BMP delivers a set of tracks, it must pay to IPR Societies which collect fees about replicating music, so making copies of tracks. Otherwise, when providing streams, the BMP must pay to IPR Societies which collect fees related with making a track available to the public.

Receivers have to pay also IPR Societies, however they pay only for providing music to the public. Thus, they pay mainly two kinds of IPR Societies. Paying BUMA/Stemra is about the copyright that the composer and/or lyricist holds, whereas paying SENA is related to the rights of the performing artists and producer. All the process described above is associated to collecting fees. Therefore the next step is to repartition all those fees. As you can see in the value model,

[3] Dutch: Stichting ter Exploitatie van Naburige Rechten, English: Foundation for Exploitation of Neighboring Rights

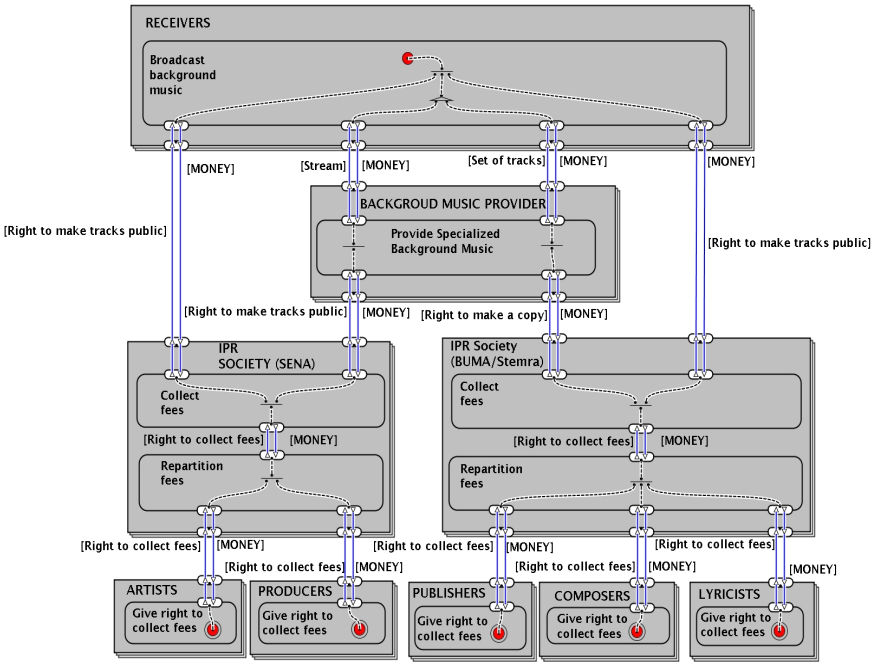

Fig. 2. SENA Case Study: Counting and Clearing Rights.

IPR societies repartition fees to a set of Right Owners. This set of Right Owner is composed mainly by Artists, Producers, Music Publishers, Composers and Lyricists.

The model in Figure 2 depicts two main value chains. These value chains are related with the way in which background music is delivered. This preliminary draft is also attempting to solve the problem related to counting and clearing tracks. To perform the counting task IPR societies must perform extra roles, however these roles are not depicted in Figure 2 because they are out of the value perspective. Consequently, those new roles must be modeled in the process model. Furthermore, this value model represents the first step to design the library of value skeletons. Taking this model as basis, several alternatives will be explored, bringing about different alternative configurations; in the end all those different configurations must be abstracted using value skeletons. Finally, to deal with the phenomenon of market liberalization, the library of value skeletons must help to forecast and model new configurations, so reusing knowledge in new environments.

7 Conclusions and Future Work

First of all, this work presents a short overview of the VALUE-IT project. It does not attempt to solve all the problems related to the VALUE-IT project but

to clarify some of the main research questions related to this project. On the other hand, this work also introduce a new business model for the clearing and counting track problem.

The theoretical relevance of this research is that it attempts to develop a baseline for an adaptive and hierarchical service bundling composition based on business value and business process perspective.

Although the main idea behind the VALUE-IT project looks clear, there are some open questions. Thus, the future work will mainly address the following problems:

- How do skeletons must look like?
- How to represent the library of value skeletons?
- How to perform a searching process?
- How to guide the building process?

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