PROJET DE FIN D'ÉTUDE

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Executive Summary

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Special Thanks to

Contents

I Presenting the context of the Project

I.1 A brief presentation of NICTA

NICTA is Australia's Information and Communication Technologies centre of excellence.[1]It was created in 2002 within the framework of the Backing Australia's Ability initiative a government plan to foster innovation in Australia. NICTA won the selection process to become Australia's ICT centre of excellence. It is supported and funded by the Australian federal government as well as states governments where laboratories are running (New South Wales, Victoria, Queensland, Australian Capital Territory). Major universities in each of the previously cited states also participate in the funding.

NICTA has 5 laboratories around Australia and employs over 700 people representing the largest research organisation dedicated to ICT in Australia. Since its foundation it has developed many collaboration with the industry especially via joint projects and company creation. NICTA not only focuses on research excellence but is actively looking for business opportunities to capture the value created by its research group. Hence an organisation divided in two main centres [NICTA 2010].

Research Groups are aiming to become leaders in their own domain of expertise with a long-term vision for ICT-innovation producing cutting edge results. Each operating in a different areas, they cover a large part of information and communication technologies. They are (in no particular order) :

- **Software Systems** is aiming to provide secure, reliable and safe systems that are proven to achieve "real world" enterprise performance and objectives.
- **Computer Vision** mainly work at a fundamental level in order to provide tools to better analyse the world through 2D videos. Their key areas of research are using the existing mathematics of multiple view geometry with new techniques such as machine learning and optimization.
- **Control and Signal Processing** produces theoretical and algorithmic work leading to innovative methods and systems. The focus is set on two main domain of application decentralized control and estimation for large distributed systems as well as the convergence between computing science and biology.
- **Optimization** is working on a new generation of optimization systems that will be operating in dynamic and noisy environment involving huge amounts of data.
- **Machine Learning** develops new algorithms and technologies to make sense of the skyrocketing amount of data gathered in all areas of human endeavour.
- **Networks** is improving the user experience in current and next generation networked environment by developing new theories, models and methods.

Business Teams are focused on exploiting the results of research through active market exploration and strategic surveillance. They provide business support for researchers and

[1]Centre of Excellence are a common term used by Australian government to qualify prestigious centre of expertise where researchers collaborate to maintain Australia's international standing in research areas of national priority [Australian Research Council 2013]

therefore cover economic sectors related to the above research groups. They are (in no particular order) :

- **Broadband and the Digital Economy** promotes new digital technologies and services in all the Australian market : government, SME, enterprises and end-users.
- **Health** develops and fosters the penetration of information technologies into the biological world leading to a better understanding of biological systems and diseases.
- **Infrastructure, Transports and Logistics** provide innovative ICT solutions to radically improve transportation systems and infrastructure networks.
- **Security and Environment** increases the security of critical and sensitive Australian infrastructure and reduces our impact on the environment.

I.2 Software System Research Group

The Business Process Compliance group in which I am working is part of the Software Systems group, one of the six research groups. The interest in business process compliance starts from a simple observation. ICT systems are costly and hard to develop because of the constantly evolving framework of norms and requirement within which they operate leading to less agility and slower development cycles especially in domains with strict legal obligations. Business process compliance is becomming an increasing area of concern in both public and private sectors because of the complexity of regulations and the lack of automated tools. The compliance market is worth tenth of billions of dollars in Australia.[NICTA 2013]

II Technical work on Regorus

II.1 Introducing the project's theoretical framework

II.1.1 Defeasible Logic

What is defeasible logic ? Why it was used in this particular case ?

II.1.2 representing norms and business processes

how do we represent these into a formal framework ?

II.1.3 Business Process Management and Compliance

What are the challenges of business process management and compliance ?
In which way Business processes foster innovation ?

II.1.4 Tools already developed : Regorus and SPINdle

What are they and what are they doing ?
Areas of improvement ?

II.2 Adding features to Regorus

II.2.1 Implementing Cooccurrent Obligations

As introduced earlier there is different types of obligation in defeasible logic. This wide range allows us to model precisely and accurately a large number of business processes and rules. However some shortcomings have been spotted leading to imprecise modelling.

Let's first introduce an example to underline the lack of appropriate obligation. Taken from the Australian **INSERT THE PROPER ACT HERE** act when needing personal information from someone it must be given by the person himself. We could model this rule with a punctual obligation like this :

$$r1 : \text{Need Personal Information} \Rightarrow [\text{Op}]\ \text{Get it in person} \tag{1}$$

In the current implementation of the compliance checking algorithm if the effect of the task triggers the rule $r1$ then the obligation is carried on to the next task where it will be checked in the *Current* obligation set. In our example that does not really make sense since once we get the information we should check **in the same task** is the information was taken personally or not.

To be able to precisely describe this kind of behaviour we need to introduce a new type of obligation, Cooccurrent Obligation. This represent an extension of punctual obligation which must be fulfilled in the same task where it was triggered. The addition of this new obligation forces us to modify the implementation of the software in the core packages to check compliance as well as in the editor part to let the user add this kind of obligation to their implementation of rules.

First let's see how this new type changes the core compliance checking algorithm :

For now the compliance checking algorithm works in five main steps for each task of the business process :

1. Get the obligations generated from the previous task
2. Get the effects of the current task
3. Generate new effects
4. Check compliance with the given obligations and effects
5. Generate the new obligations for the next task

We need to make a few changes to take into account the new type of obligation. First, in the generated obligations look for Cooccurrent obligations then check these obligations on the literals just generated and see if there is a violation. If this is the case then the chain of reparation is marked as activated and checked for compliance in the task.

As we said before cooccurrent obligations are close relatives of punctual obligations this allows us to leave the compliance checking algorithm and related routines unchanged and just call it again with the freshly generated cooccurrent obligation as punctual obligations and the new effects. To sum up we add three new steps to the pseudo algorithm introduced previously :

1. Get cooccurrent obligation from the set of new obligations
2. Call the compliance checking algorithm to check compliance with the new effects and the cooccurrent obligations

3. Generate new obligations for the next task and forward

Now we need to take into account violation and compensation. If a cooccurrent obligation is violated and if it is part of a compensation chain we will check the rest of the chain in the very same task it was activated.

II.2.2 XOR splits and the condition associated to them

In order to be able to implement conditional splits in business processes it is necessary to have XOR splits and corresponding XOR join. Unfortunately with this mandatory tool for business process modelling comes some issues, especially with punctual obligations, that we will try to tackle.

First let see how XOR nodes behave in business process modelling with a little example from a demonstration video of Regorus [*NICTA* 2012].

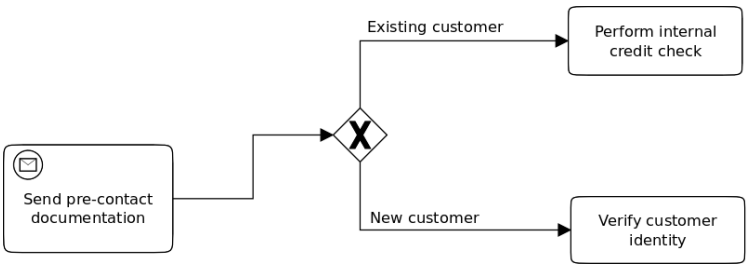

Figure 1: A simple example of XOR split

This sample shows an important feature of the XOR nodes : annotations on the edges. When checking compliance all the possible executions of a given business process are computed which mean in one case we will have *Existing Customer* as an effect and in another thread we will have *New Customer* as effect. The issue is in the way we take these effects into account to check compliance in the following tasks.

For now Regorus puts "dummy nodes" between the XOR split and the first task as shown in the following illustration.

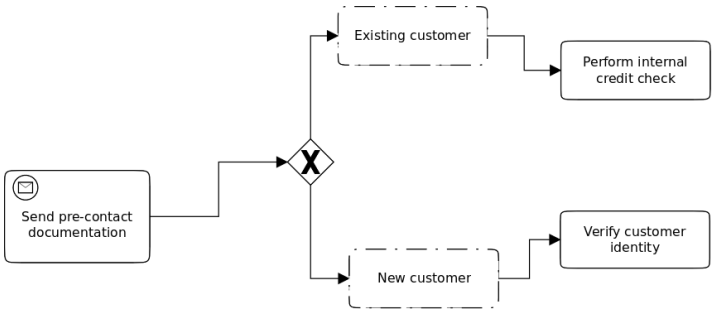

Figure 2: Illustration of the "dummy nodes" added by regorus

But a better behaviour would be to take these directly into account without the need for

dummy nodes. Indeed punctual and cooccurrent obligations cannot be handled properly in this case. If the node before the XOR split yields an punctual obligation like this one p $\rightarrow$ [Op]q then with the actual implementation the obligation will be checked in the dummy nodes when it should be checked for compliance in the first "real" node following the XOR split.

Again for cooccurrent obligations if the effect associated with the edge of the XOR split yields a cooccurrent obligation like p $\rightarrow$ [Oc]q then it will be checked on the dummy node when it should, once again, be checked for compliance in the first "real" node following the XOR split.

We chose to follow these steps to implement this desired behaviour :

1. Identify the XOR splits in the business process graph
2. When on a XOR split make a call to SPINdle to generate the obligations triggered by the effect associated with the edge
3. Forward the new obligations to the next node without calling the compliance checking algorithm

II.2.3 Solving and implementing the propagation of the effects problem

II.2.4 Extending the theoretical model by adding time

III Strategic reflection on Regorus

III.1 A critical summary of the work done

Historical analysis of what have been done, what failed...

They tried to go to the market without any market study

III.2 Find a business model for Regorus

III.2.1 Two-sided markets

On two sided market the main sources are [Parker and Alstyne 2010] [Eisenmann, Parker, and Van Alstyne 2006] [Rochet and Tirole 2003]

Which business model ?
Who are the clients ?
Who are our concurents ?

III.2.2 How Business Process Modeling is integrated in knowledge management

We think that one of the ways to promote Regorus and improve its market penetration is to research the ways it can be useful for a company. Apart from its main purpose of asserting compliance of business processes Regorus can be useful at higher levels by being a part of the knowledge management plan of the firm for example.

Knowledge Management is a relatively new field of study born in the early eighties when researchers in management looked into the importance of knowledge in organization.[Wiig 1997]

With the increasing use of information technologies by firms and the escalation in the size of data stored by those knowledge management became a legitimate concern. How to make sense of these ever growing raw databases and extract tangible information out of it? At the same time organization started to consider knowledge as an asset following the lead of Japanese car manufacturers.[Koenig and Neveroski 2008] How can a firm use its tacit and explicit knowledge to adapt better to the ever changing market ?

Knowledge management was introduced in popular press in the early nineties mainly through the work of Nonaka. [Nonaka 1991] He is the one who later popularized the concept of Ba in his famous article [Nonaka and Konno 1998]. In this article he introduces the SECI model aiming to give a framework for knowledge creation within a firm. This model is based on the interactions between explicit and tacit knowledge through four main phases : Socialization, Externalization, Combination, Internalization. Business process explicitation through Regorus editor can be seen as part of the externalization phase where one's knowledge is expressed using the BPMN formalism. Later on this new material can be used in the Internalization phase where this explicit knowledge is used and put into practice as formely formalizes business processes can help in the training of new employees for example.

Regorus is a great tool for companies because it helps them explicit their practices and internal knowledge into a new figurative language such as BPMN. This translates personal, sticky

knowledge to be translated into an explicit, normative form leading to a better understanding and transmission of know-how. In this sense Regorous is more than just a tool to check the compliance of processes it is also a powerful way of managing knowledge in the firm and therefore leading to better results.

III.3 What can be done to improve market penetration

Qualitative market study to discover what our clients are sensible to.
Ask questions about the key points presented in the previous section about two-sided networks

IV My contribution

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