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Third International Conference, TrustBus 2006
Kraków, Poland, September 2006
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Preface

This book presents the proceedings of the Third International Conference on Trust, Privacy and Security in Digital Business (TrustBus 2006), held in Kraków, Poland, September 5-7, 2006. The conference continues from previous events held in Zaragoza (2004) and Copenhagen (2005), and maintains the aim of bringing together academic researchers and industry developers to discuss the state of the art in technology for establishing trust, privacy and security in digital business. We thank the attendees for coming to Kraków to participate and debate the new emerging advances in this area.

The conference programme included two keynote presentations, one panel session and eight technical papers sessions. The keynote speeches were delivered by Jeremy Ward from Symantec EMEA on the topic of "Building the Information Assurance Community of Purpose", and by Günter Karjoth from IBM Research - Zurich, with a talk entitled "Privacy Practices and Economics — From Privacy Policies to Privacy SLAs."

The subject of the panel discussion was "Is Security Without Trust Feasible?" chaired by Leszek T. Lilien from Western Michigan University, USA. The reviewed paper sessions covered a broad range of topics, from access control models to security and risk management, and from privacy and identity management to security protocols. The conference attracted 70 submissions, each of which was assigned to four referees for review. The Programme Committee ultimately accepted 24 papers for inclusion, which were revised based upon comments from their reviews.

We would like to express our thanks to the various people who assisted us in organizing the event and formulating the programme. We are very grateful to the Programme Committee members, and external reviewers, for their timely and rigorous reviews of the papers. Thanks are also due to the DEXA Organizing Committee for supporting our event, and in particular to Mrs. Gabriela Wagner for her help with the administrative aspects. We would also like to thank Sokratis Katsikas, Javier López and Günther Pernul for their past efforts in establishing the conference series, and their valuable advice and assistance in enabling us to take it forward.

Finally we would like to thank all of the authors who submitted papers for the event, and contributed to an interesting set of conference proceedings.

September 2006
Kraków, Poland

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Table of Contents

Session 1: Privacy and Identity Management

Session 2: Security and Risk Management

Session 3: Security Requirements and Development

Session 4: Privacy Enhancing Technologies and Privacy Management

Session 5: Access Control Models

Session 6: Trust and Reputation

Session 7: Security Protocols

Session 8: Security and Privacy in Mobile Environments

Towards Scalable Management of Privacy Obligations in Enterprises

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Abstract. Privacy management is important for enterprises that collect, store, access and disclose personal data. Among other things, the management of privacy includes dealing with privacy obligations that dictate duties and expectations an enterprise has to comply with, in terms of data retention, deletion, notice requirements, etc. This is still a green area open to research and innovation: it is about enabling privacy-aware information lifecycle management. This paper provides an overview of the work we have done in this space: definition of an obligation management model and a related framework; implementation of a prototype of an obligation management system integrated both in the context of the PRIME project and with an HP identity management solution. This paper then focuses on an important open issue: how to make our approach scalable, in case large amounts of personal data have to be managed. Thanks to our integration work and the feedback we received, we learnt more about how users and enterprises are likely to deal with privacy obligations. We describe these findings and how to leverage them. Specifically, in the final part of this paper we introduce and discuss the concepts of parametric obligation and "hybrid" obligation management and how this can improve the scalability and flexibility of our system. Our work is in progress. Further research and development is going to be done in the context of the PRIME project and an HP Labs project.

1 Introduction

Enterprises that store, manage and process personal data must comply with privacy laws and satisfy people's expectations on how their personal data should be used. Privacy laws [1,2,3] dictate policies on how personal data should be collected, accessed and disclosed according to stated purposes, by keeping into account the consent given by data subjects (e.g. customers, employees, business partners) and by satisfying related *privacy obligations* including data retention, data deletion, notice requirements, etc.

The management and enforcement of privacy policies in enterprises is still a green field: key requirements include automation, cost reduction, simplification, compliance checking and integration with existing enterprise identity management solutions. In particular the management of *privacy obligations* is open to research and innovation. Privacy obligations [4] dictate duties and expectations on how personal data should be

S. Fischer-Hübner et al. (Eds.): TrustBus 2006, LNCS 4083, pp. 1 – 10, 2006.

managed. They require enterprises to put in place *privacy-aware information lifecycle management* processes.

During the last two years we have been active in the *privacy obligation management* [5] space by: (1) researching and defining an explicit model for privacy obligations; (2) formalising the representation of obligations; (3) introducing an obligation management framework and a related *obligation management system* to deal with the explicit scheduling, enforcement and monitoring of privacy obligations.

This paper provides an overview of the current status of this work. Our current obligation management system allows end-user to customise - in a fine-grained way - their personal preferences: related privacy obligations (based on the set of obligations supported by an enterprise) are automatically generated and associated to users' data. However, this causes scalability issues when large sets of personal data have to be managed, because our system generates a large set of associated privacy obligations: their current management is expensive and inefficient. Addressing this aspect is very important for enterprises that potentially have to deal with millions of data records related to customers, employees or business partners.

The integration phase of our work in PRIME [6] and with an HP identity management solution [8, 12] and the feedback we received from third parties (customers, HP businesses, etc.) has helped us to better understand how users are actually likely to define their privacy preferences and which realistic support enterprises can provide in terms of handling privacy obligations. We describe these findings and highlight how they can actually be leveraged to address the scalability issues. The final part of this paper describes our related ideas, based on the concept of *parametric obligations* and *a hybrid obligation management model*. This work is in progress and will be carried on in the context of PRIME and an HP Labs project.

2 Management of Privacy Obligations in Enterprises

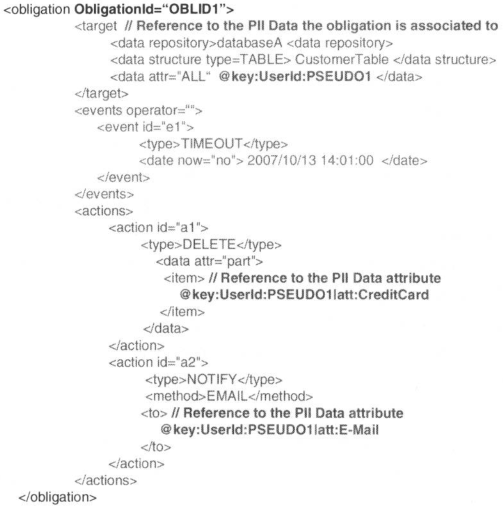
This section provides a quick overview of our R&D work to manage privacy obligations in enterprises. Details can be found in [4,5,9].

Privacy obligations [4,5,9] are policies that dictate expectations and duties to enterprises on how to handle personal data and how to deal with its lifecycle management in a privacy-aware way. They include: dealing with data deletion and retention, dealing with data transformation (e.g. encryption), sending notifications, executing workflows involving human and system interactions, logging information, etc.

Related work includes EPAL [10] that defines a privacy language, inclusive of a placeholder for obligations, in the context of an Enterprise Privacy Authorisation architecture [11]. This is important work but it does not define obligation policies in detail and subordinate their enforcement to access control. Similar observations apply for XACML [8] and other work in the obligation management space.

In our vision the management and enforcement of privacy obligations must not be subordinated to the management and enforcement of access control policies [4]. For example, deletion of personal data at a precise point in time has to happen independently from the fact that this data has ever been accessed. This fundamental concept is at the very base of our work and differentiates it from related work. A more detailed comparison of our work against related work is provided in [4,5,9].

Based on this concept, we introduced an *obligation management model* [4,5,9], where privacy obligations are "first class" entities, i.e. they are explicit entities that are modeled, managed and enforced. In this model, a privacy obligation is an "object" [9] that includes: *Obligation Identifier*; T*argeted Personal Data* (e.g. data affected by the obligation); *Triggering Events* (e.g. time-based events); *Actions* (e.g. data deletion, sending notifications) – see Figure 1.



```
<obligation ObligationId="OBLID1">
        <target  // Reference to the PII Data the obligation is associated to
              <data repository>databaseA <data repository>
              <data structure type=TABLE> CustomerTable </data structure>
              <data attr="ALL"  @key:UserId:PSEUDO1 </data>
        </target>
        <events operator="">
           <event id="e1">
                 <type>TIMEOUT</type>
                 <date now="no"> 2007/10/13 14:01:00  </date>
           </event>
        </events>
        <actions>
              <action id="a1">
                    <type>DELETE</type>
                       <data attr="part">
                        <item> // Reference to the PII Data attribute
                           @key:UserId:PSEUDO1|att:CreditCard
                        </item>
                     </data>
              </action>
              <action id="a2">
                     <type>NOTIFY</type>
                     <method>EMAIL</method>
                    <to> // Reference to the PII Data attribute
                       @key:UserId:PSEUDO1|att:E-Mail
                    </to>
              </action>
        </actions>
</obligation>
```

Fig. 1. Simple Example of Privacy Obligation

Figure 1 shows a very simple example of a privacy obligation (expressed in XML), associated to the personal data of a user (in the example having the *PSEUDO1* unique identifier) and stored in an enterprise RDBMS database. This obligation dictates the deletion of a personal attribute (credit card detail) at a predefined point in time, along with the need to notify the user via e-mail when this happens.

In general, our privacy obligations can target personal data stored in various types of data repositories, including databases, LDAP directories, meta/virtual directories, file systems, etc. This further differentiates our work and approach from related work, that is mainly focused on the management of data in RDBMS databases, e.g. [13].

We designed an *obligation management framework* [4,5,9] and an associated *obligation management system* [4,5,9] to represent these privacy obligations, schedule and enforce them and monitor for their the fulfillment. In our system, *data subjects* (i.e. users) can explicitly define privacy preferences (e.g. on data deletion, notifications, etc.) on their personal data at their disclosure time (e.g. during a self-registration process) or at any subsequent time. These preferences are automatically turned into privacy obligations, based on the types of obligations supported by an enterprise. *Enterprise privacy administrators* can further associate other privacy obligations to personal data, for example dictated by laws or internal guidelines.

As a proof-of-concept, a working prototype has been fully implemented and integrated in the context of the EU PRIME project [6]. To demonstrate the feasibility and applicability of this work within enterprises, we also integrated it with HP OpenView Select Identity (an HP state-of-the-art identity management solution [7]) to manage privacy preferences and related privacy obligations during user provisioning and account management processes.

3 Scalability Issues

Our obligation management system provides flexible, fine-grained mechanisms to end-users (and enterprise privacy administrators) to express their privacy preferences (e.g. deletion preferences, notification preferences, etc.) on their personal data: based on the types of obligations supported by an enterprise, our system automatically turns these preferences into privacy obligations (by means of translation rules) and manages them. Users have the capability to customize aspects of these obligations (e.g. actual combinations of events and actions) as long as they are supported by the enterprise. The side-effect of this flexibility (at least in the current implementation) is that for each piece of personal data disclosed by a user, one or more privacy obligations can be generated, each of them with its own specific properties and requirements. For example, each user of an e-commerce site could potentially specify different privacy preferences (e.g. deletion date, notification preferences, encryption of data, data minimisation, etc.) and privacy constraints (among the ones supported by the enterprise) on their personal data. Figure 2 shows this approach (architectural details are omitted for simplicity).

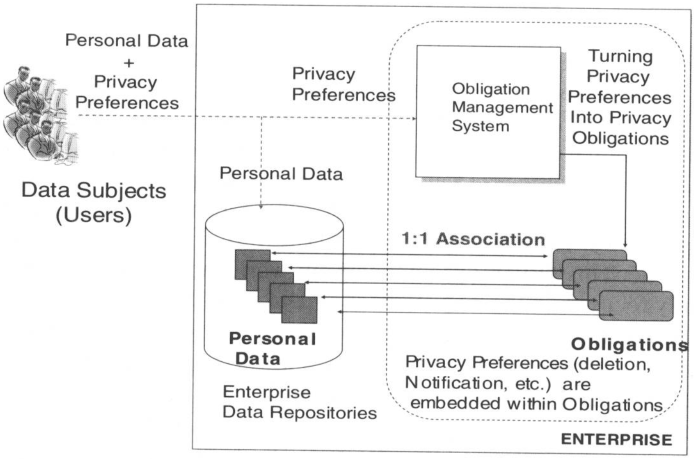


Fig. 2. Current Model: Direct Association of Privacy Obligations to Personal Data

In case large amounts of users are managed by the enterprise, large amounts of privacy obligations are created and subsequently they must be explicitly scheduled, enforced and monitored by our obligation management system. In general, the