

# Chapter 27

## An Interoperable Cross-Context Architecture to Manage Distributed Personal E-Health Information

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### ABSTRACT

*Ensuring interoperability across different healthcare providers becomes an important issue with a potentially large return on investment (ROI) potential when multiple healthcare providers are collaborating in an e-Health system. In cross-context communications, the same information can be expressed by means of different types or values. This chapter proposes a new architecture for cross-context identity management in the e-Health application domain, aiming to improve interoperability between healthcare providers when context-specific information, such as patients' identifiers, is transferred from one context to another. Furthermore, an algorithm for issuing and converting context-specific identifiers, based on cryptographic techniques, is presented. How the proposed cross-context interoperability service can be integrated in a real-world e-Health system is explained with a use case scenario.*

### INTRODUCTION

During the last years, both industry and research communities are witnessing a growing interest in the technological evolution of electronic health

(e-Health) systems, such as Google Health (Google-Health, 2009) and Microsoft software and solutions for the health industry (MicrosoftHealth, 2009a, 2009b). The goals of these systems are threefold, primarily, to provide ubiquitous access to lifelong clinical records of a patient to all relevant stakeholders, including the patient, anytime, anywhere, on any

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device; in addition, to integrate and enrich the clinical, medical and operational knowledge to support lifelong health guidance of citizens within a community, region, and country; moreover, to streamline the workflow into shared clinical and operational pathways in order to enable disease management and optimally support the clinical process. Combining these three goals facilitates inter-professional collaboration, while guaranteeing the privacy of the patient.

The major technical challenges facing e-Health services are facilitating efficiency, information retrieval and availability, and cross-context interoperability, without compromising the patient's privacy. The rapid aging of populations, combined with pressure on budgets for healthcare delivery, and technological advances are the driving forces behind these challenges. Hence, in the realm of e-Health, security and privacy issues have a deep impact. Privacy refers to the protection of entities' private information. Security techniques, such as access control mechanisms, are adopted in e-Health systems to ensure that only involved and properly authorized parties have access to sensitive data.

### **From Provider-Centric Towards User-Centric System in a Single Healthcare Provider**

Traditional e-Health solutions were mainly concerned with a limited view of patient information, taking a provider-centric approach, and mostly limited to a single provider. A paradigm shift is taking place in the e-Health domain, with an evolution from provider-centric towards user-centric healthcare. In the user-centric system, the transparency of the health care decision making and information flow is significantly increased from the patient's perspective.

The adoption of user-centric federated identity management (FIM) systems can help keep the number of parties dealing with a person's healthcare information as small as possible. For

example, the circle of trusted parties should not be extended or broken by moving from a paper-based to an e-based Health administration. A patient expects a trust relation with medics; however, as in the past with a doctor's secretary, the trust with a system administrator may not be the same as with medics.

In provider-centric identity and information management systems, data is hosted and managed by a service provider using a central repository. This has various advantages from the service provider's point of view, such as being cost effective and easily scalable. The disadvantage is that by applying such an approach, the user loses control over his or her personal information. The user can regain this control with a user-centric identity management (IDM) system.

In user-centric IDM, the user is put in the centre of interest and is given control over personal information, and access to logs on information that was exchanged across and inside the healthcare contexts. In particular, this means that the user can influence or even specify the policies that must be enforced when service providers wish to process his information, and that he can verify whether information has been exchanged without his personal consent. This has the obvious advantage of better protecting the privacy of each individual user. However, responsibility for storing and updating correct data then lies with the user.

### **The Need for Interoperability Across Different Healthcare Providers**

Interoperability of different identity and information systems of multiple healthcare providers has become an important issue, especially as an increasing number of healthcare service providers collaborating online, using a wide range of e-Health systems, this holds in particular if they refer to the information stored in each other's systems.

Previous work mostly emphasizes the e-Health solutions from a provider-centric viewpoint, and reveals an unsatisfactory provision for the interoper-

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