Chapter 9
Enabling Interoperability of Patient Summaries across Europe with Triplespaces

Alessio Carenini
CEFRIEL, Italy

Davide Cerri
STI Innsbruck, University of Innsbruck, Austria

Reto Krummenacher
STI Innsbruck, University of Innsbruck, Austria

Elena Simperl
STI Innsbruck, University of Innsbruck, Austria

ABSTRACT
Healthcare services are naturally distributed, both from a geographical and an organisational point of view; they include various national and local authorities, as well as different actors ranging from general hospitals to individual physicians. One of the main items on the eHealth agenda of the European Union is the establishment of electronic patient summaries as an instrument to facilitate the pervasive delivery of healthcare and to guarantee its continuity across national boundaries. This chapter analyses several existing large-scale eHealth systems, chosen among the most prominent and established ones in Europe, and analyses their ability to cope with the high heterogeneity challenges of a Europe-wide solution. It then introduces triplespaces, a new-generation middleware based on the concept of semantic spaces, and presents a possible realisation of a European Patient Summary based on a triplespace infrastructure. The chapter shows that this solution can cope with the decentralisation, asynchronicity, subsidiarity, and security requirements arising in the European Patient Summary setting.

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Enabling Interoperability of Patient Summaries

INTRODUCTION

Healthcare infrastructures are commonly decentralised and heterogeneous in terms of information management, document structures, protocols and language bindings. Interoperability of medical information systems has been recognised as a key challenge and a fundamental need for citizens, healthcare professionals, and governmental authorities.

This is also reflected in the agenda of the European Union in the field of eHealth (Commission of the European Communities, 2004), which includes the design and promotion of electronic patient summaries. This is a first step towards the realisation of a European eHealth infrastructure that is capable of integrating information and applications across different countries, in order to facilitate the pervasive delivery of healthcare services and to ensure patient mobility within the European Union. Current efforts in this area (such as project epSOS [n. d.]) aim at providing recommendations for such an infrastructure.

The technical realisation of a European Patient Summary (EPS) infrastructure needs to build on a middleware layer which can provide the needed integration features, and which is able to deal with the key design principles specified in the European Interoperability Framework (2004): multi-laterality, subsidiarity, multilingualism and security. Based on these principles, we identify the following requirements for an efficient EPS infrastructure:

- A decentralised and distributed infrastructure is a prerequisite for respecting the multi-laterality principle, allowing all healthcare authorities to become parties to the same common network and efficiently publish and retrieve patient information independently of their location.
- Asynchronous interaction among institutions is equally important to enable the access and exchange of patient information at any time, and independently of the momentary availability of the communication partners.
- In order to keep the EPS infrastructure as minimally invasive as possible, and to guarantee the subsidiarity principle, the middleware should be able to provide flexible data and service integration to cope with the inherent heterogeneity problems that occur both at the data level (e.g., different encoding schemes and terminologies) and at the service level (e.g., different protocols).
- Support for appropriate security mechanisms is important with respect to regional, national and European regulations for the treatment of citizen data.

National healthcare information systems, which exist or are currently under development in various member states of the European Union, need, to some extent, to address the same challenges when integrating different information systems from different organisations (such as hospitals and local health authorities). A Europe-wide infrastructure to share patient summaries takes such issues to a new level, compared to its nationals counterparts; requiring all the European countries to redesign their national systems, or even just to adopt a unique standard for messaging and medical vocabularies, would be very inefficient, and probably unrealistic. In addition, in a Europe-wide context, security constraints become more complex, as they have to reflect different national regulations concerning access to medical data of the citizens.