Chapter I
The Development, Testing, and Deployment of a Web Services Infrastructure for Distributed Healthcare Delivery, Research, and Training

ABSTRACT

The ultimate effectiveness in terms of quality achievements should be a key concern of systems built from Web services. To this end, in this chapter we focus upon our experiences in the development, testing, and deployment of systems built on Web services to support a variety of distributed healthcare applications. The middleware that underpins these applications—termed SIF for service-oriented interoperability framework—has been developed to meet the needs of various applications, with these applications being drawn from the areas of healthcare delivery, research, and training. The very nature of the applications that the middleware supports—and their associated data—means that nonfunctional properties such
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as usability, maintainability, and dependability are key concerns for us, and necessarily influence our development processes.

INTRODUCTION

In this chapter we report upon our experiences in utilising open standards and technologies in the development of service-oriented interoperability framework (SIF), a system that is being developed to support the secure transfer and aggregation of clinical data for use in applications as diverse as the provision of support for patients suffering from long-term conditions, image analysis for cancer research, and radiologist training.

SIF is built on technologies that are portable, interoperable, standards-based, freely available, and, where possible, open source, with a view to developing solutions that require minimum buy-in from end users and are straightforward for application developers to code against. The effective reuse of existing data, stored in legacy systems, can only be facilitated by an approach based on interoperability and open standards and this is a key motivation for adopting the approach that we have.

There are, however, drawbacks associated with taking such an approach. Many aspects of proprietary solutions or toolkit approaches that already exist have had to be developed ‘from scratch.’

The principles upon which the middleware is based were developed through experiences in the e-DiaMoND project (Brady, Gavaghan, Simpson, Mulet-Parada, & Highnam, 2003), in which a consortium developed a ‘grid’ to support various applications pertaining to breast cancer, and were reported by Power, Politou, Slaymaker, and Simpson (2005).

SIF—in various forms—is being used to underpin the efforts of three interdisciplinary projects: Generic Infrastructure for Medical Informatics (GIMI) (Simpson, Power, Slaymaker, & Politou, 2005), NeuroGrid (Geddes, Lloyd, Simpson, Rossor, Fox, Hill et al., 2005), and a prototype demonstrator project for the UK’s National Cancer Research Institute (NCRI) Informatics Initiative (Pitt-Francis, Chen, Slaymaker, Simpson, Brady, van Leeuwen et al., 2007; Slaymaker, Simpson, Brady, Gavaghan, Reddington, & Quirke, 2005). Early versions of the technology are underpinning NeuroGrid and the NCRI demonstrator project (with an overview being reported by Simpson, Power, Slaymaker, Russell, and Katzarova [2007]); a more recent version—offering greater levels of functionality—is being used to underpin GIMI. The responsibility for the development and the deployment of the middleware for all of these projects lies with the present authors.

It is, perhaps, worth considering each of the projects in turn. The main aim of GIMI is to develop a generic, dependable middleware layer capable of:

• (in the short term) supporting data sharing across disparate sources to facilitate healthcare research, delivery, and training;
• (in the medium term) facilitating data access via dynamic, fine-grained access control mechanisms; and
• (in the longer-term) interfacing with technological solutions deployed within the National Health Service (the UK’s free-at-point-of-service national healthcare provider).

The key deliverable of a middleware layer is being complemented by three applications, that is, the self-management of long-term conditions, image analysis for cancer care, and training and auditing for radiologists, that utilise it.
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