Chapter 2.4
On The Development of Secure Service–Oriented Architectures to Support Medical Research

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ABSTRACT

In this article we report upon our experiences of developing Web-services based infrastructures within two e-health projects. The first—a small demonstrator project funded by the UK's National Cancer Research Institute (NCRI)—is concerned with facilitating the aggregation of different types of data (specifically, MRI scans and histopathology slides) to aid the treatment of colorectal cancer; the second—a rather larger project funded by the UK's Medical Research Council (MRC)—is concerned with the development of a virtual research environment to support neuro-imaging research. In both cases, the underlying infrastructures are being developed by a team that is based in Oxford; it is the experiences of this team that we report upon in this article. We also report upon how we have considered the future potential for our systems interoperating with other systems which are deployed within the UK's National Health Service (NHS).

INTRODUCTION

The potential for distributed, service-oriented architectures to support healthcare delivery, training and research has been acknowledged widely. In this article we report upon our experiences of developing Web-services based infrastructures within two projects. In both cases, the architectures have been influenced by our earlier experiences within the e-DiaMoND project (Brady, Gavaghan, Simpson, Parada, & Highnam, 2003), which explored the development of distributed architectures to support a number of breast-cancer related applications. Although the e-DiaMoND infrastructure was based on grid services—rather than Web services—we have used many of the lessons learnt and adapted many of our designs from that project.

The two projects that we report upon are rather different in nature, but the same broad principles underpin both. The first project—a small demonstrator project funded by the UK's National Cancer Research Institute (NCRI)—is concerned with facilitating the aggregation of different types of data to aid the treatment of colo-rectal cancer. The second project is concerned with the development of a virtual research environment to support neuro-imaging research. In both cases, the projects involve multi-disciplinary teams from a number of institutions, with the underlying infrastructures being developed by a team within Oxford. It is the experiences of this team that we report upon here.

In Power, Politou, Slaymaker, and Simpson (2005), the authors considered the information security requirements incumbent upon health grid architectures deployed within the United Kingdom, and presented an architecture for an idealised health grid that was informed by those requirements; in Power, Politou, Slaymaker, and Simpson (2006), the authors described requirements for, and an approach to, the facilitation of fine-grained access control within systems in which third party Web services are deployed.

In this article, we describe how some of the ideas from those articles have been combined to produce designs for, and implementations of, secure infrastructures, which underpin the two aforementioned e-health projects. We also comment our future intentions—which involve building on the work undertaken thus far and considering the potential for inter-operating with systems deployed within the UK's National Health Service (NHS).

The structure of the remainder of the article is as follows. In the next section we describe the background and motivation for our work. Then we reprise the contributions of Power et al. (2005) and Power et al. (2006), which, together, provide a blueprint for our work. Next we report upon our experiences within two projects: an NCRI-funded demonstrator project and the MRC-funded NeuroGrid project. We first introduce the projects, and then present an overview of the technologies used within our solutions. We also briefly consider some of the challenges that we have faced. Finally, we summarise the contribution of this article and outline some areas for future work, much of which is being undertaken with the GIMI (Generic Infrastructure for Medical Informatics) project (Simpson, Power, Slaymaker, & Politou, 2005).

CONTEXT

A number of *e-health* projects have been undertaken in recent years, with the term *grid computing* (see, for example, Foster & Kesselman [1999] and Berman, Fox, & Hey [2003]) often being used within this context. Some interpretations of the term grid computing characterise it as the utilisation of a specific collection of services and toolkits to build a distributed architecture; other interpretations are rather looser and characterise it as the bringing together and sharing of compute and data resources from different administrative domains—in the form of a *virtual organisa-*

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