Chapter 4
Secure Service Rating in Federated Software Systems Based on SOA

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ABSTRACT

The Service-oriented Architecture (SOA) paradigm mostly provides a suitable approach as to meet the requirements of flexible distributed software systems. Referring to the activities for the standardization of Web Service semantics or alternatively the introduction of intelligent search mechanisms future software architectures are supposed to integrate software components as remote services of foreign providers. If the authors assume that such services can be standardized e.g. as components of standard business application systems the vision of a service economy arises where services of the same type can be marketed by different providers. A service consumer on the other hand could choose the service he likes best at runtime. However, this vision is clouded by a multiplicity of risks which meet each other in the question of the specific reliability and trustworthiness of service providers in a certain context. Previous research activities picked up this problem whereby a lot of promising approaches and frameworks have been developed which concern the negotiation of trust within open network architectures like grids or peer-to-peer networks. Nevertheless, the genesis of the trust relationship between two network nodes has been neglected. This chapter presents an approach for the establishment of reputation in federated software systems where central network instances for the management of evaluations are avoided. In the authors’ approach the service providers are responsible for this task on their own. The authors present a novel security protocol for the message-based exchange of service evaluations that deters service providers from manipulating their own ratings.

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INTRODUCTION

Today the SOA concept is accepted as one of the most important instruments for the construction of integrated software systems. As an integral core concept of distributed applications Web Services (a common way to implement a SOA) are driving further software developments and advancements and they are widely spread in the area of integrated software systems engineering. Lately when aspects like the openness of software systems or their sustainable interoperability were frequently discussed more from a marketing-oriented point of view, those features seemed to be claimed as essential rather by the seller- than by the buyer-side. Thus, software market actors talked about exceptional extras, surpluses, added values and additional future benefits of software systems being equipped with service interfaces. Since business application systems have been established as major sources for competitive advantages enterprises are now running far more than only a few programs in parallel. As those software systems support users in their every-day work and business processes do not stop at artificial borders set by the organizational structure of enterprises, today the effort of software projects is shifting from the development of business functionality towards the construction of integrated business solutions where services (and Web Services in particular) play an important role.

Taking a look at current service-based integration methods in practice, however, similarities to old-dated green field software engineering models become obvious were developers created software independently. Then the consideration of existing foreign software artifacts as possible components of new solutions was clouded by major technical incompatibility problems. We have to admit, that well-understood software engineering concepts of nowadays like object-orientation and component frameworks still do not allow a comparison between modern software engineering and well-established industrial engineering disciplines. However, the development of reusable software components is already supported by matured implementation platforms. Technologies can be considered as standardized and widely accepted and specialized design concepts for “industry-like” software components engineering are available.

At its main idea the concept of SOA goes one step further. Assumed that there are reusable software components already existing also the operation responsibility of those components is shifted to the component provider-side. That means that a service in a SOA can be seen as software component which can be used without dependencies to other components the service consumer has to care about. Following the vision of a marketplace for software components the SOA concept might also serve as basis for an automated mediation between consumers and providers in future software industries where software is not only developed in a collaborative and competitive manner but also software operation and management tasks are shared by a set of market competitors.

If the functionality of software services can be standardized it is possible to compare them according to their non-functional attributes as e.g. the price, the performance or the trustworthiness of the associated provider e.g. as regards to the non-misuse of input information.

The chapter describes how quality attributes of services can be measured by service consumers and how those measurements can be used for the establishment of trust in service markets. The shown concept of a decentralized reputation architecture is based on service evaluations that are given by service consumers and managed by service providers. Firstly we give an insight into the main concepts of existing trust models and the characteristics of federated systems as basis for service marketplaces. Then we describe the new concept of an architecture for the management of service ratings as basis for the establishment of trust. Therefore we introduce a novel security protocol called Service Evaluation Protocol.