Chapter 4.15
A Decision Support System for Selecting Secure Web Services

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INTRODUCTION

Web service is becoming an important area of business processing and research for enterprise systems. Various Web service providers currently offer diverse computing services ranging from entertainment, finance, and health care to real-time application. With the widespread proliferation of Web Services, not only delivering secure services has become a critical challenge for the service providers, but users face constant challenges in selecting the appropriate Web services for their enterprise application systems. Security has become an important issue for information systems (IS) managers for a secure integration of Web services with their enterprise systems. Security is one of the

determining factors in selecting appropriate Web services. The need for run-time composition of enterprise systems with third-party Web services requires a careful selection process of Web services with security assurances consistent with the enterprise business goal. Selection of appropriate Web services with required security assurances is essentially a problem of choice among several alternative services available in the market. The IS managers have little control of the actual security behavior of the third-party Web services, however, they can control the selection of right services which could likely comply their security requirements. Selecting third-party Web services arbitrarily over the Internet is critical as well as risky.

With increasing security challenges to the enterprise systems, there is a need for an automatic decision support system (DSS) for the selection of

appropriate secure Web services. A DSS analyzes security profiles of candidate Web services and compares them with the security requirements of the enterprise system. The IS managers can make decisions from such systems more easily regarding which Web service is to be integrated with their applications. A DSS could make a comparative analysis of various security properties between a candidate Web service and the enclosing enterprise system including the consequences of different decision alternatives in selecting Web services. It could also project the likely additional security properties needed for the system if the candidate Web service lacked required properties. The complex nature of selecting secure Web services could not be easily managed without such a DSS support. With the rapidly evolving nature of security contexts in the field of enterprise systems, decision support systems for selecting secure Web services can play an increasingly important role.

This article proposes an architecture of an easy-to-use security decision support system (SDSS) for selecting Web services with security assurances consistent with the enterprise business goal. The SDSS stores security profiles of candidate Web services, compares properties with the security requirements of the enterprise system, and generates alternatives with consequences. Supporting the choice making process involves the evaluation and comparison of alternative Web services in terms of their security properties. To minimize the risks of selecting the wrong Web services for the enterprise systems, the SDSS can provide managers with consistent and concise guidance for the development of security criteria. Our proposed SDSS has been developed to provide IS managers with information necessary to make informed decisions regarding the selection of Web services. The basic components of the SDSS include a knowledge base of various security properties and an *inference mechanism* which uses a set of rules. The architecture consists of three components: (i) *Defining security criteria*; (ii) *Security profiling of Web services*; and (iii) *Generating alternatives*.

BACKGROUND

Making decisions concerning the selection of Web services with security compliances often strains the cognitive capabilities of the IS managers because many complex attributes are involved. Analyzing these complex attributes and predicting the security outcome of independent Web services is a daunting task. The human intuitive judgment and decision making capability is rather limited, and this ability deteriorates further with the complexity of assessing security issues manually. The final decision to select a particular Web service for an enterprise system is critical because such a decision is considerably influenced by many complex security attributes of the service. A computer-aided decision making process may manage this complexity in a more optimal way. One of many decision-making approaches in which decisions are made with the help of computer-aided process is generally called decision support system (DSS). A DSS can take many different forms. In general, a DSS is a computerized system for helping people make decisions (Alter, 1980; Power, 1997, 2007). According to Finlay (1994) and Turban (1995), a DSS is an interactive, flexible, and adaptable computer-based information system, especially developed for supporting the decision making. In our context in this article, we emphasize a knowledge-driven decision that helps managers to make a choice between alternative Web services based on their supporting security properties. It is an interactive computer-based system that aids IS managers in making judgments and choices regarding the selection of Web services which match their expectation. This article focuses primarily on the components that process various criteria against the provided data and generates best alternatives.

During the process of selecting appropriate Web services for the enterprises, IS managers often make decisions on which Web services should be integrated with their application. Considering the value of the information assets of the organizations,

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